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U.S. Department of Energy

Annual Report of Waste Generation and Pollution Prevention Progress 1996

August 1997

Office of Pollution Prevention
Office of Environmental Management
Washington, D.C.

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EM-77 Web Site Address: http://twilight.saic.com/wastemin/
Waste generation data and pollution prevention project data are searchable by reporting site and waste type.

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Preface

Department of Energy
Washington, DC 20585

I am pleased to inform you that the Department of Energy completed 490 pollution prevention projects in 1996, reducing waste generation by approximately 134,000 cubic meters, and saving approximately $127 million. The Department reduced the generation of radioactive and hazardous wastes from its routine operations by 60 percent between 1993 and 1996, surpassing our 50 percent goal.

The Department must continue to sponsor pollution prevention programs and projects to maintain the progress already made. The new challenge for the Department in the next ten years will be to reduce wastes from its environmental restoration and stabilization activities. The waste from these activities will increase significantly as we accelerate our cleanup program. The Office of Environmental Management must take full advantage of the Pollution Prevention opportunities if it is to achieve its Accelerated Cleanup Plan goals.

The Federal and contractor employees at each Department of Energy site are the reasons for the past pollution prevention successes. I am asking for their continuing commitment to tackle the new challenge. We must incorporate pollution prevention as part of our everyday operating culture. Prevention is much more than meeting our Executive Order requirements; it enables us to protect the environment and public health, and save taxpayer dollars.

I am looking forward to reporting continued success next year.

Alvin L. Alm
Assistant Secretary for Environmental Management

At A Glance

This fifth Annual Report presents and analyzes DOE complex-wide waste generation and pollution prevention activities at 35 reporting sites from 1993 through 1996. In May 1996, the Secretary of Energy established a 50 percent waste reduction goal (relative to the 1993 baseline) for routine operations radioactive and hazardous waste generation, to be achieved by December 31, 1999. Routine operations waste generation decreased 25 percent from 1995 to 1996, and 62 percent overall from 1993 to 1996.

Pollution Prevention Accomplishments

- A total of 490 waste reducing pollution prevention projects were completed by 32 of the 35 reporting sites in 1996.
- Pollution prevention projects resulted in a cost savings of approximately $127 million.
- Pollution prevention projects reported in 1996 reduced radioactive waste generation by approximately 39,000 cubic meters, low-level mixed waste by 1,000 cubic meters, hazardous waste by 21,000 metric tons, and sanitary waste by 72,000 metric tons.
- The Oakland, Oak Ridge, and Richland Operations Offices reported the largest estimated total waste reduction from pollution prevention projects in 1996.
- The Albuquerque, Oak Ridge, and Richland Operations Offices reported the largest estimated total cost savings from pollution prevention projects in 1996.

Progress Toward the Secretarial Goals

- The DOE complex has achieved the 50 percent reduction goal (relative to the 1993 baseline) for radioactive, low-level mixed, and hazardous wastes for calendar year 1996. This level must be maintained each year through 1999 to fully meet the Secretarial Goals.
- The DOE complex is making good progress in meeting the 33 percent reduction goal for sanitary waste.

DOE Complex-Wide Waste Generation

- In 1996, approximately 284,000 cubic meters of waste were generated:
  - 83,200 cubic meters of radioactive waste (29 percent)
  - 3,500 cubic meters of mixed waste (one percent)
  - 33,100 metric tons of hazardous waste (12 percent)
  - 164,200 metric tons of sanitary waste (58 percent).
- Excluding sanitary waste and wastewater:
  - Routine operations waste decreased 25 percent and cleanup/stabilization waste decreased 15 percent from 1995 to 1996.
  - Cleanup/stabilization waste volume (97,200 cubic meters) was more than four times greater than routine operations waste volume (22,500 cubic meters).
  - High-level waste and transuranic waste were generated primarily by routine operations.
  - Low-level radioactive, low-level mixed, and hazardous waste were generated primarily by cleanup/stabilization activities.
  - Low-level radioactive waste was the largest waste type generated, accounting for approximately 67 percent of both the routine operations and cleanup/stabilization waste generated.
- The above generation excludes 11e(2) byproduct material (soil or other material contaminated by extraction or concentration of uranium or thorium). The only site reporting byproduct material in 1996 was the Weldon Spring Site Remedial Action Project, which includes 473,100 cubic meters of low-level radioactive waste and 130 cubic meters of low-level mixed waste.

Waste Generation by Operations/Field Office

- The Oak Ridge Operations Office generated the largest amount of routine operations waste (41 percent) and the largest amount of total waste in 1996 (21 percent).
- The Richland Operations Office generated the largest amount of cleanup/stabilization waste (21 percent).

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Chapter 1.0 Introduction

1.1 Pollution Prevention Program Mission and Goals

The mission of DOE's pollution prevention program is to reduce the generation and release of DOE wastes and pollutants by implementing cost-effective pollution prevention techniques, practices, and policies. Pollution prevention is also required by various Federal laws and Executive Orders, including, but not limited to, the Pollution Prevention Act of 1990, the Resource Conservation and Recovery Act, Executive Order 12856, and Executive Order 12873.

Waste reduction goals were established by the Secretary of Energy in the 1996 *Pollution Prevention Program Plan* (DOE/S-0118). That plan serves as the principal crosscutting guidance to all DOE Headquarters and field personnel, including Operations/Field Offices, laboratories, and contractor personnel, to fully implement pollution prevention programs within the DOE complex by the year 2000.

1.2 Purpose

The *Annual Report of Waste Generation and Pollution Prevention Progress 1996* is to be used by DOE managers as a management tool to assess progress and refine program activities to optimize waste reduction and pollution prevention results. This Report presents 1996 complex-wide pollution prevention accomplishments and a profile of waste generation by the reporting Operations/Field Offices.

1.3 Computerized Data Base

Waste generation data and pollution prevention project data submitted by the DOE reporting sites are available for review on the World Wide Web. Waste generation data are searchable by reporting site, Cognizant Secretarial Office, and waste type. Pollution prevention project data, including waste avoided and cost savings, are searchable by pollution prevention activity, reporting site, and waste type. The DOE Office of Pollution Prevention Web site address is: http://twilight.saic.com/wastemin/.

DOE Complex-Wide Waste Reduction Goals by End of December, 1999

(as compared to 1993 Baseline)

For Routine Operations:

- Reduce radioactive (low-level) waste generation by 50 percent.
- Reduce low-level mixed waste generation by 50 percent.
- Reduce hazardous waste generation by 50 percent.
- Reduce sanitary waste generation by 33 percent.
- Reduce total releases and offsite transfers for treatment and disposal of toxic chemicals by 50 percent.

For All Operations, Including Cleanup/Stabilization Activities:

- Recycle 33 percent of all sanitary waste.

For Affirmative Procurement:

- Increase procurement of Environmental Protection Agency-designated recycled products to 100 percent, except when items are not commercially available competitively at a reasonable price, or do not meet performance standards.

1.4 Scope

The major DOE sites have gathered and reported data on waste generation, quantity of material recycling/reuse, affirmative procurement, and pollution prevention projects. Affirmative procurement data are for fiscal year 1996, as required by the Environmental Protection Agency. All other information is based on calendar year 1996. The sites are responsible for the quality of their data, and have provided explanations when their 1996 waste generation data differed from their 1995 data by more than 20 percent.

Data were requested from all DOE sites that meet specific reporting thresholds. Thirty-five sites met these established thresholds in 1996. Two sites changed their names: the Idaho National Engineering Laboratory became the Idaho National Engineering and Environmental Laboratory, and the Oak Ridge K-25 Site became the East Tennessee Technology Park.

All of the sites in the calendar year 1995 Annual Report are included in this Report, except for the following sites:

- Naval Petroleum Reserve No. 1, Pinellas Plant, and the Federal Energy Technology Center (Pittsburgh) are excluded because their waste generation was below the reporting threshold.
- Bonneville Power Administration is excluded because it became a Reinvention Laboratory under the Vice President's National Performance Review, and received Secretarial delegation of authority to be exempted from reporting.
- Formerly Utilized Sites Remedial Action Project did not provide waste generation data for this Report.

The data were analyzed to assess: (1) the Department's progress in meeting its pollution prevention goals, (2) the contribution of each Operations/Field Office to the Department's progress, and (3) Operations/Field Office achievements in relation to the pollution prevention performance measures. The Department uses the following performance measures for pollution prevention:

- Secretarial pollution prevention goals;
- Total number of pollution prevention projects implemented;
- Quantity of waste reduced/avoided; and
- Savings realized.

The following pages of this Report present the highlights of DOE's Pollution Prevention Program for 1996, including pollution prevention accomplishments and waste generation information for the Complex and individual Operations/Field Offices. Appendix A contains detailed data tables illustrating complex-wide pollution prevention accomplishments and waste generation data, Appendix B contains affirmative procurement data, Appendix C provides point of contact information, Appendix D presents the methodology for calculating pollution prevention project Return-on-Investment, and Appendix E provides a glossary of terms.

1996 Reporting Requirement Thresholds for Sites

A site must report waste generation and waste minimization data/information if the site generated any regulated waste and one or more of the following criteria are met:

- Generated greater than 50 cubic meters of low-level radioactive waste.
- Generated greater than one cubic meter of mixed waste (hazardous and radioactive).
- Generated more than 10 metric tons of Resource Conservation and Recovery Act regulated hazardous waste.
- Generated more than 10 metric tons of Toxic Substances Control Act regulated hazardous waste.

DOE Operations/Field Offices and Reporting Sites, 1996

Albuquerque Operations Office

- Inhalation Toxicology Research Institute
- Kansas City Plant
- Los Alamos National Laboratory
- Pantex Plant
- Sandia National Laboratories/California
- Sandia National Laboratories/New Mexico
- Waste Isolation Pilot Plant

Chicago Operations Office

- Argonne National Laboratory–East
- Argonne National Laboratory–West
- Brookhaven National Laboratory
- Fermi National Accelerator Laboratory
- Princeton Plasma Physics Laboratory

Idaho Operations Office

- Idaho National Engineering and Environmental Laboratory

Nevada Operations Office

- Nevada Test Site
- North Las Vegas Facility

Oakland Operations Office

- Energy Technology Engineering Center
- Lawrence Berkeley National Laboratory
- Lawrence Livermore National Laboratory
- Stanford Linear Accelerator Center

Oak Ridge Operations Office

- East Tennessee Technology Park
- Oak Ridge National Laboratory
- Oak Ridge Y-12 Plant
- Paducah Gaseous Diffusion Plant
- Portsmouth Gaseous Diffusion Plant
- Weldon Spring Site Remedial Action Project

Ohio Field Office

- Battelle Columbus Laboratories
- Fernald Environmental Management Project
- Mound Plant
- West Valley Demonstration Project

Richland Operations Office

- Hanford Site
- Pacific Northwest National Laboratory

Rocky Flats Field Office

- Rocky Flats Environmental Technology Site

Savannah River Operations Office

- Savannah River Site

Headquarters Reporting Sites

- Western Area Power Administration
- Western Environmental Technology Office

Chapter 2.0 DOE Complex Pollution Prevention Progress

The DOE Waste Generation Goals call for a 50 percent reduction in routine operations waste generation compared to 1993 baseline levels for most waste types by the end of December 1999, except for sanitary waste, which is to be reduced 33 percent. In addition, a goal of 33 percent recycling for all sanitary wastes, regardless of the source, must be met in 1999. Sanitary waste is the largest waste type generated, accounting for 80 percent of total 1996 routine waste. The DOE Waste Generation Goals have been achieved for 1996 relative to the 1993 baseline on a complex-wide basis for low-level radioactive, low-level mixed, and hazardous wastes.

Achievements CY 1996

Number of P2 Projects:	490
Total Waste Reduced:	134,000 cubic meters
Cost Savings:	$127 million

Category	Performance Measure	Goal
Radioactive Waste	63% reduction	50%
Mixed Waste	59% reduction	50%
Hazardous Waste	75% reduction	50%
Sanitary Waste	21% reduction	33%
Recycling	37% recycled	33%
Affirmative Procurement	60% purchased	100%

Note that accomplishments with respect to the toxic release performance measure are not addressed in this Report because data are not currently available.

2.1 Pollution Prevention Program Performance Measures

In 1996, approximately 134,000 cubic meters of waste were reduced throughout the DOE complex. These waste reductions contributed $127 million in savings (Table 2.1). In addition to these site accomplishments and the continuation of the High Return-on-Investment program, in 1996 DOE began several key pilot programs and new initiatives to instill a pollution prevention ethic throughout the DOE complex. These include the Generator Set-Aside Fee Program, Re-Engineering Waste Management, Incorporating Pollution Prevention Incentives into Site Operating Contracts, Incorporating Pollution Prevention into the National Environmental Policy Act process, and Life Cycle Asset Management. See Chapters 3 and 4 for additional information about these programs.

As anticipated, pollution prevention projects reduced waste generation in all waste categories. The DOE complex realized the largest volume reductions in low-level radioactive, hazardous, and sanitary wastes (Table 2.1).

Reduction of sanitary waste accounted for 54 percent of the total waste reduction amount in 1996, and resulted in approximately $11 million in

Table 2.1 Waste Reduction and Avoided Costs in 1996
(in Cubic Meters*)

Waste Type	Waste Reduction	Reported Cost Avoidance**
High-Level	<0.5	$ 31,000
Transuranic	400	$22,500,000
Low-Level Radioactive	39,300	$33,200,000
Low-Level Mixed	1,300	$34,100,000
Hazardous*	20,700	$26,500,000
Sanitary*	71,900	$10,600,000

* Assuming one cubic meter is equivalent to one metric ton.
** DOE's recommended approach to calculating Return-on-Investment is shown in Appendix D.

avoided costs. Excluding sanitary waste, low-level radioactive and hazardous wastes constituted 64 percent and 34 percent of the waste avoided in 1996. Although the volumes of transuranic, low-level, mixed, and hazardous waste reduced were much lower than the sanitary waste reduction volume, the avoided cost amounts in these categories exceeded the avoided cost for sanitary waste because the life cycle costs for managing these wastes are higher.

2.2 Waste Generation

During 1996, DOE complex-wide waste generation reached about 280,000 cubic meters (Figure 2.1). High-level and transuranic wastes accounted for one percent of the complex-wide waste generation total, and therefore are not included in Figure 2.1. Most of the complex-wide waste generation was produced by cleanup/stabilization activities (61 percent). Low-level, hazardous, and sanitary waste constituted 28 percent, 12 percent, and 58 percent of the total waste generated respectively.

2.3 Routine Operations Waste Generation

Routine operations waste consists of normal operations waste produced by any type of production operation; analytical and/or research and development laboratory operations; treatment, storage, and disposal operations; "work for others;" or any other periodic or recurring work that is considered ongoing in nature.

The generation of routine operations waste decreased from 1993 (DOE's baseline year) to 1996 by 62 percent, excluding sanitary waste (Table 2.2).

Figure 2.2 illustrates DOE complex-wide routine operations waste generation trends by waste type from 1993 through 1996. It is evident that DOE has successfully achieved its waste generation reduction goals for low-level radioactive, low-level mixed, and hazardous wastes three years ahead of schedule. Sanitary waste shown in Figure 2.2 shows the Department is making good progress toward meeting the goal in 1999.

2.4 Cleanup/Stabilization Waste Generation

Cleanup/stabilization waste, including primary and secondary waste, is generated a single time by the environmental restoration of contaminated media (soil, groundwater, surface water, sediments, etc.); stabilization of nuclear and nonnuclear (chemical) materials; and deactivation and decommissioning of facilities. Goals for the reduction of secondary wastes generated by

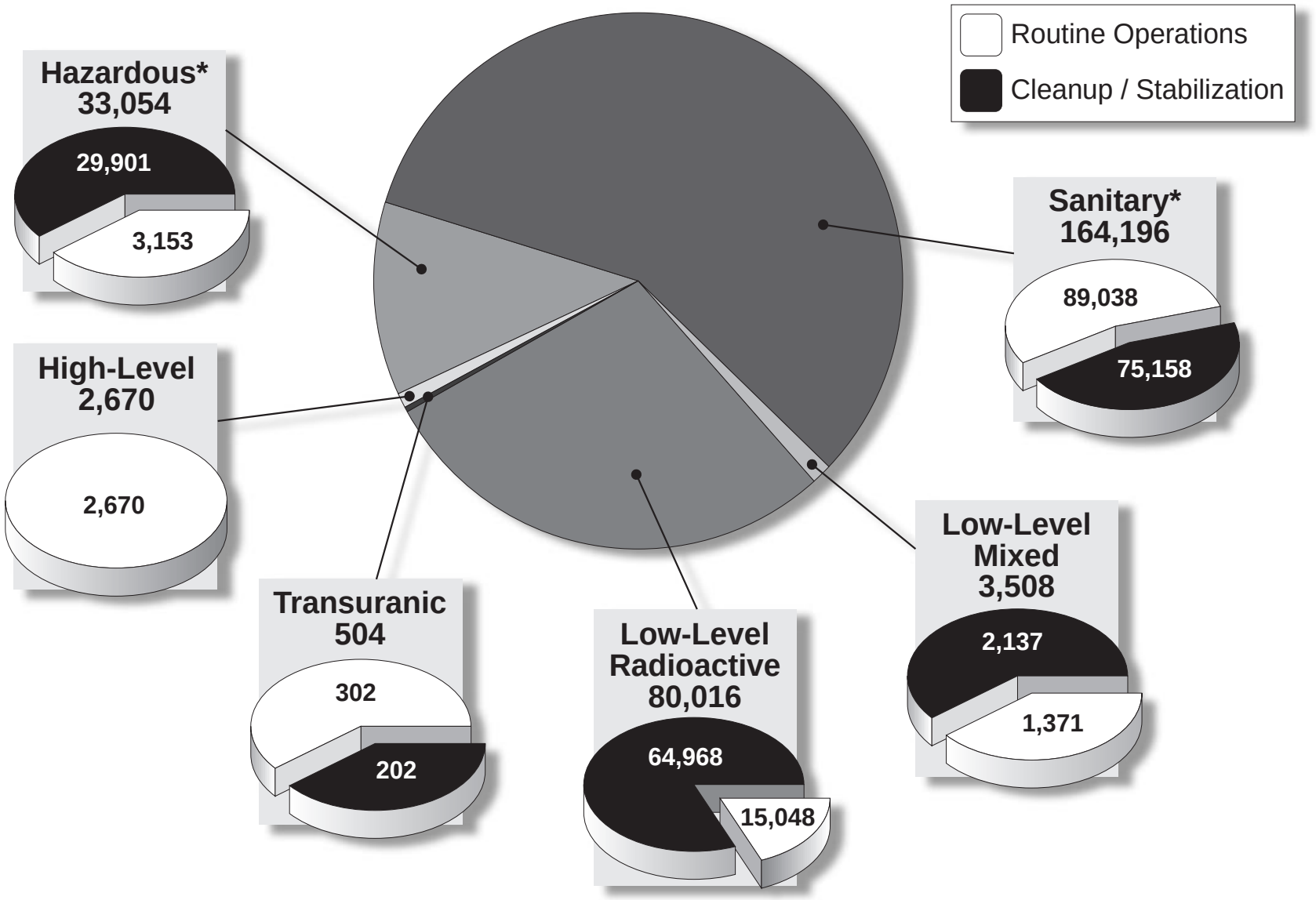
Table 2.2 Complex-Wide Routine Operations Waste Generation 1993-1996
(in Cubic Meters*)

Waste Type	1993	1994	1995	1996
High-Level	1,708	2,071	2,496	2,670
Transuranic	709	546	336	302
Low-Level Radioactive	40,807	31,868	21,894	15,048
Low-Level Mixed	3,322	2,834	1,335	1,371
Hazardous*	12,424	12,497	4,103	3,153
*Total Excluding Sanitary Waste**	*58,970*	*49,816*	*30,164*	*22,544*
Sanitary* **	112,274	110,208	97,797	89,038
GRAND TOTAL*	**171,244**	**160,024**	**127,961**	**111,582**

* Assuming one cubic meter is equivalent to one metric ton.

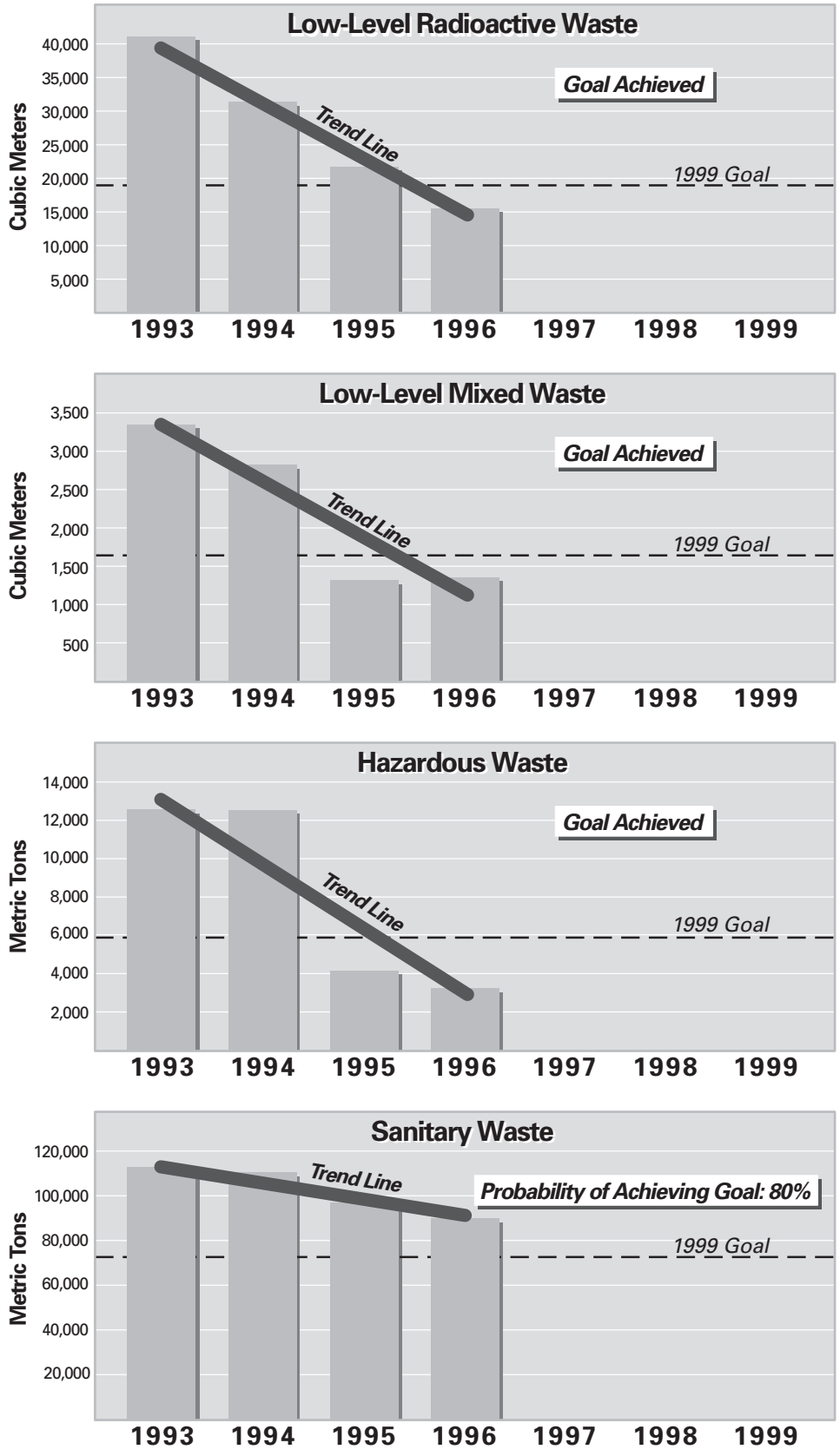
** In 1993, some sites optionally separated and reported sanitary waste as routine operations or cleanup/stabilization waste. Beginning in 1994, sanitary waste was required to be separated and reported as routine operations or cleanup/stabilization.

Figure 2.1 1996 Waste Generation
(in Cubic Meters)*



* Assuming one cubic meter is equivalent to one metric ton.

Figure 2.2 DOE Complex-Wide Routine Operations Waste Generation Trends 1993–1996, with 1999 Secretarial Achievement Probability



cleanup/stabilization activities will be set by the Department by the end of 1997.

In 1996, the 35 reporting sites generated approximately 172,000 cubic meters of cleanup/stabilization waste, including sanitary waste (Table 2.3). This represents 61 percent of the total DOE complex-wide waste generated. Cleanup/stabilization waste generation decreased 22 percent from 1993 to 1996 excluding sanitary waste.

Table 2.3 Complex-Wide Cleanup/Stabilization Waste Generation 1993–1996

(in Cubic Meters*)

Waste Type	1993	1994	1995	1996
High-Level	0	0	0	0
Transuranic	459	214	156	202
Low-Level Radioactive	88,163***	42,603§	86,848§	64,968§
Low-Level Mixed	4,533***	14,035§	4,518§	2,137§
Hazardous*	30,848	8,900	22,679	29,901
*Total Excluding Sanitary Waste**	*124,003*	*65,752*	*114,201*	*97,208*
Sanitary* **	26,222	16,010	103,117	75,158
GRAND TOTAL*	**150,225**	**81,762**	**217,318**	**172,366**

* Assuming one cubic meter is equivalent to one metric ton.

** In 1993, some sites optionally separated and reported sanitary waste as routine operations or cleanup/stabilization waste. Beginning in 1994, sanitary waste was required to be separated and reported as routine operations or cleanup/stabilization.

*** Includes 11e(2) byproduct material (soil or other material contaminated by extraction or concentration of uranium or thorium) at the Weldon Spring Site Remedial Action Project.

§ Excludes 11e(2) byproduct material (soil or other material contaminated by extraction or concentration or uranium or thorium). The only site reporting byproduct material in 1996 was the Weldon Spring Site Remedial Action Project, which includes 473,100 cubic meters of low-level radioactive waste and 130 cubic meters of low-level mixed waste.

Chapter 3.0 Pollution Prevention Accomplishments

This chapter describes the programmatic and site-level pollution prevention accomplishments for 1996. Programmatic accomplishments include the following key pilot programs and new initiatives.

3.1 Generator Set-Aside Fee Program

During fiscal year 1996, three Operations/Field Offices (Albuquerque, lead; Oak Ridge; and Savannah River) conducted a pilot program to provide incentives to increase pollution prevention projects at their facilities. The program, known as the Generator Set-Aside Fee Program, collected fees based on the amount and type of waste from all generators on the site to fund projects to reduce the generation of waste.

At the eight pilot sites, $1.8 million in fees were collected, about half of which were used to fund pollution prevention projects in fiscal year 1996. These projects are projected to yield a first-year cost savings of $5.7 million. The other half is being used to fund fiscal year 1997 projects. Based upon the success of this program, the Department's Pollution Prevention Executive Board agreed that all Operations/Field Offices should be encouraged to adopt this or a similar program at their sites.

3.2 Re-Engineering Waste Management

The Department is testing an initiative at five sites to return responsibility for newly generated waste to the generator organization. The Environmental Management Office of Waste Management currently is responsible for all newly generated DOE waste. This initiative is expected to promote pollution prevention implementation across the Department.

The initiative will become a formal program in fiscal year 1999/2000 if the Office of Management and Budget and DOE agree the pilot was successful in fiscal year 1997. A "mock billing" program currently is underway at the five sites to show generators how much the waste they currently generate would cost if they had to pay for it out of their own budgets.

3.3 High Return-on-Investment Program

To save taxpayer money while reducing waste, starting in 1994 the Department's Pollution Prevention Executive Board initiated a high Return-on-Investment pilot program to demonstrate the economic benefit of implementing pollution prevention projects. The program focuses on projects with high potential for reducing operational costs. Twelve Return-on-Investment projects were funded in fiscal year 1994, and an additional 21 projects were funded in fiscal year 1996. Savings over the next 10 years are projected to exceed $132 million (in 1996 dollars), at a cost of $9 million. Appendix D presents the methodology utilized by DOE for calculating the Return-on-Investment for pollution prevention projects.

3.4 Incorporating Pollution Prevention Incentives into Site Operating Contracts

To increase pollution prevention activities at DOE sites, the Department has begun an effort to incorporate pollution prevention incentives into site operating contracts. At the Savannah River Operations Office alone, DOE set aside almost 10 percent of the total site award fee contract ($1.3 million) to motivate the prime contractor to implement pollution prevention initiatives. Prompted by the success of the Savannah River

effort, the Offices of Environmental Management and Defense Programs have issued guidance to Operations/Field Office Managers encouraging them to use a similar award fee system to encourage pollution prevention. Energy Research operations already have contract provisions to encourage pollution prevention. The Pollution Prevention Executive Board is working to expand this concept to all DOE organizations.

3.5 Incorporating Pollution Prevention into the National Environmental Policy Act Process

The Department has made an effort over the past two years to encourage those associated with the National Environmental Policy Act process to include pollution prevention principles in their project reviews. In 1993, the Office of Environment, Safety and Health issued a memorandum encouraging consideration of pollution prevention in the National Environmental Policy Act process. The Office of National Environmental Policy Act Oversight also recommended that pollution prevention be a consideration in the preparation of Environmental Assessments and Environmental Impact Statements.

In 1996, the Office of Environmental Management issued guidance to its managers encouraging the incorporation of pollution prevention principles into the National Environmental Policy Act review process as a way to reduce health and environmental impacts.

3.6 Life Cycle Asset Management

DOE Order 430.1 requires the Department to treat Departmental assets as valuable national resources and to plan, acquire, operate, maintain, and dispose of them in a cost effective manner. DOE is implementing this Order on a site-by-site basis through the establishment, by contract or financial assistance agreements, of site-specific performance criteria and a performance measurement system. DOE's Office of Pollution Prevention is working with the Office of Field Management to further pollution prevention practices in the field. Pollution prevention practices are included in the Life Cycle Asset Management guidance and training materials.

3.7 Accomplishments by Pollution Prevention Project Categories

Thirty-two of the 35 reporting sites conducted pollution prevention activities in 1996, including opportunity assessments, training, and outreach, but only the projects that resulted in a quantifiable waste reduction are highlighted in this chapter.

Table 3.1 1996 Pollution Prevention Projects

Operations/ Field Office	Number of Pollution Prevention Projects		
	Source Reduction	Segregation	Recycle/Reuse
Albuquerque	29	23	60
Chicago	7	-	29
Idaho	2	1	4
Nevada	7	-	18
Oakland	6	-	43
Oak Ridge	19	6	41
Ohio	4	7	16
Richland	25	4	85
Rocky Flats	-	-	5
Savannah River	9	12	19
Headquarters	-	1	8
TOTAL	**108**	**54**	**328**

Projects that are primarily waste treatment or solely physical volume reduction (e.g., compacting and repackaging of waste) are also excluded. The projects are documented on the EM-77 Web site, and key accomplishments are summarized here. The pollution prevention projects are categorized into source reduction, segregation, and recycle/reuse practices. Table 3.1 presents the breakdown

of the number of projects by pollution prevention activity type as reported by each Operations/Field Office.

The reporting sites conducted pollution prevention activities, including training and outreach, but only the projects that resulted in a quantifiable waste reduction are summarized in this chapter. Projects that are primarily waste treatment or solely physical volume reduction (e.g., compacting and repackaging of waste) are also excluded.

3.7.1 Source Reduction

Source reduction practices include any activities that reduce the amount of radioactive and/or hazardous substances, pollutants, or contaminants entering any wastestream, or other release into the environment, prior to recycling, treatment, or disposal.

3.7.2 Segregation

Segregation of material is the practice of separating or isolating contaminated materials from non-contaminated materials, or the separation/isolation of one waste type from another in an attempt to minimize the amount of the more noxious (and costly) material for disposal.

3.7.3 Recycle/Reuse

Recycling and reuse practices include any activities that divert potential wastestreams for more efficient conversion of unreacted components, or the reuse of auxiliary materials for beneficial purposes.

3.8 Pollution Prevention Activities

Pollution prevention activities, as implemented across the Complex, yield a variety of waste reduction and financial benefits. Analysis of pollution prevention projects reveals certain activities where significant returns are realized from application of proven concepts. Figure 3.1 identifies pollution prevention practices in each of the three main activity categories applicable to DOE operations. The figure prioritizes the practices according to technical areas of focus, identifying certain practices proven to provide high returns, and commensurately where emphasis should be placed. The figure also presents proven practices that have reported successful results on a case-by-case basis as well as new or under-utilized practices that will be aggressively investigated for potential high returns.

Although pollution prevention projects are implemented for the primary purpose of reducing waste, their financial benefits typically extend beyond avoided waste management costs. The total savings from these projects may include significant contributions resulting from improved efficiency, reduced labor, reductions in personal protective equipment requirements, reduced raw material, utility, and supply usage; and reduced maintenance activities. The financial benefits of pollution prevention projects are wide-reaching, often affecting multiple organizations within a single site.

The following tables (Tables 3.2, 3.3, 3.4) present selected source reduction, segregation, and recycle/reuse projects reported for 1996.

Figure 3.1 Pollution Prevention Activity Focal Areas

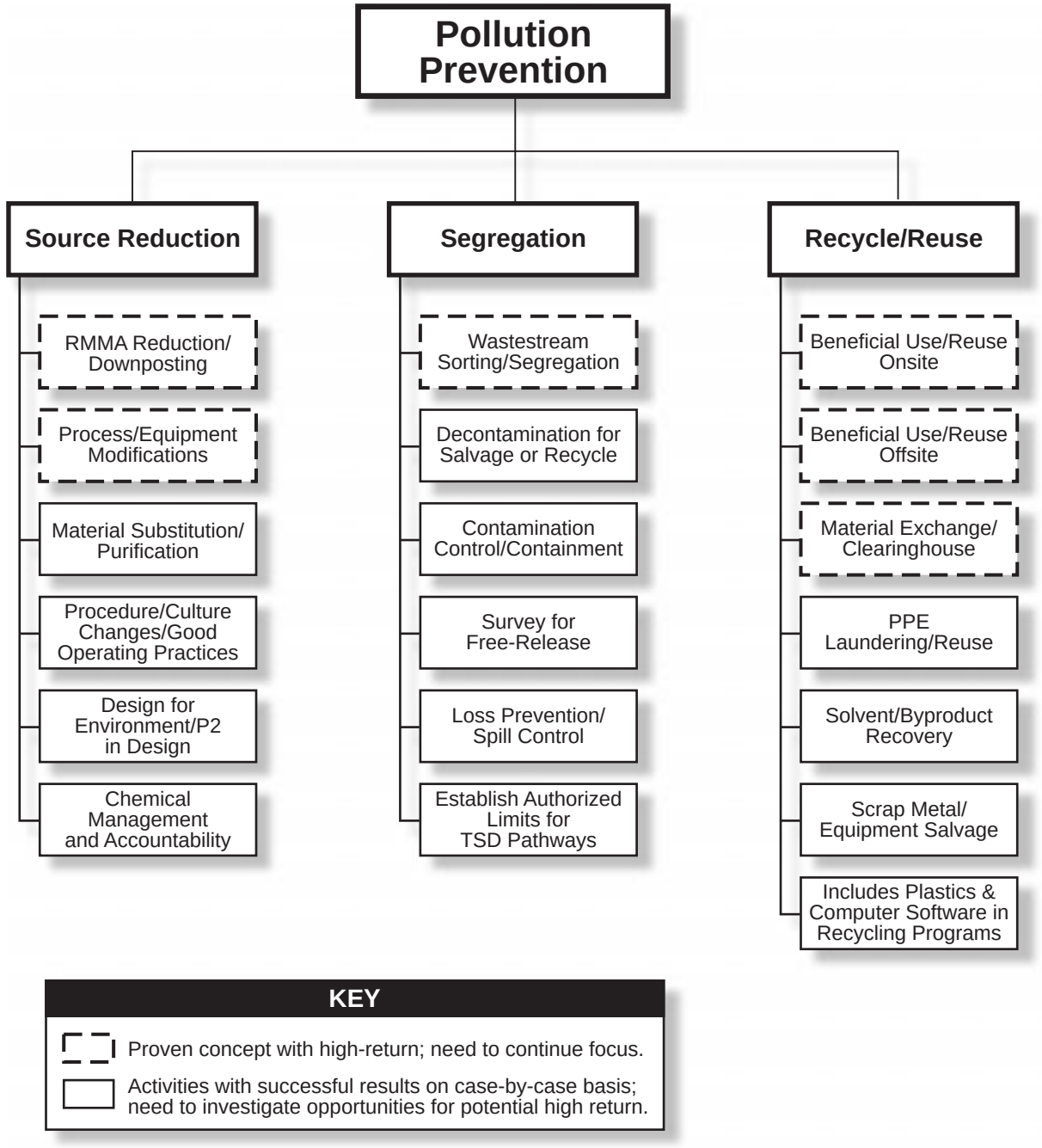


Table 3.2 Pollution Prevention Source Reduction Projects, 1996

Source Reduction	Accomplishments	Waste Reduction*	Cost Savings
Radiological Material Management Area Reduction/ Downposting	**Oak Ridge Y-12 Plant:** Building 9995 originally had approximately 19,000 square feet of floor space designated as a radiological area. The radiological area was reduced to 2,300 square feet through work restructuring, decontamination, and relocating radiation signs. This effort reduces the generation of low-level radioactive waste, since all materials entering the radiological area are disposed as low-level radioactive waste.	180 m^3 Low-Level	$1,000,000
	Los Alamos National Laboratory: A comprehensive waste minimization initiative aimed at reducing Radiological Control Areas was implemented. This initiative required the integrated support of several organizations to improve procedures for waste type verification, manage suspect radioactive material, minimize operational impacts of reductions to Radiological Control Areas, and improve work flow patterns to minimize waste and maximize efficiency.	57 m^3 Low-Level 28 m^3 Transuranic	$3,500,000
	Savannah River Site: Radiologically Contaminated Areas were rolled back to Radiological Buffer Areas in H-Area, thus eliminating the need for personnel protective equipment and avoiding the generation of low-level radioactive waste in these areas.	380 m^3 Low-Level	$558,000
	Savannah River Site: Radiologically Contaminated Areas were rolled back to Radiological Buffer Areas in F-Area.	104 m^3 Low-Level	$156,000
	Savannah River Site: Radiologically Contaminated Areas were rolled back to Radiological Buffer Areas in H-Area Tank Farm.	82 m^3 Low-Level	$134,000
	Savannah River Site: Radiologically Contaminated Areas were rolled back to Radiological Buffer Areas in the Tritium Facility.	99 m^3 Low-Level	$177,000
	Hanford Site: Radiologically Controlled Areas were rolled back to Radiological Buffer Areas.	9 m^3 Low-Level	$213,000
	Oak Ridge National Laboratory: Radiologically Controlled Areas were reduced/downgraded.	4 m^3 Low-Level	$14,000
	Oak Ridge Y-12 Plant: Radiologically Controlled Areas were reduced/downgraded.	8 m^3 Low-Level	$118,000
	Hanford Site: Surface contamination at the Tank Farms was reduced to levels to allow the Radiologically Controlled Areas be reduced to Underground Material status.	11,075 m^3 Low-Level	$580,000

** Assuming one cubic meter is equivalent to one metric ton.*

Table 3.2 Pollution Prevention Source Reduction Projects, 1996
(Continued)

Source Reduction	Accomplishments	Waste Reduction*	Cost Savings
Process/Equipment Modification	**Idaho National Engineering and Environmental Laboratory:** Single-use, prefabricated wood and nylon tents were replaced with reusable steel framed and polyvinylchloride fabric tents. The new tents were decontaminated and reused, thus reducing the amount of low-level radioactive waste disposed.	190 m^3 Low-Level	$228,000
	Savannah River Site: Single-use contamination control huts and glovebags were replaced with reusable prefabricated huts and glovebags. Use of the new multi-application contamination control devices reduced low-level waste generation.	860 m^3 Low-Level	$3,380,000
	East Tennessee Technology Park: Existing sanitary sewer manholes, pipes, and pipe linings were replaced to reduce stormwater infiltration. Elimination of the excess rainwater reduces the burden on the wastewater treatment facility, and improves process efficiency, thereby avoiding National Pollutant Discharge Elimination System violations.	57,000 mt Sanitary	$20,900,000
	Hanford Site: The intake of the filtered raw water system feeding the pump seal water system and the deentrainment pad sprayers in the 242-A evaporator process system was modified to allow the recycling of condensate from the process condensate collection tank. This modification reduces the amount of liquid low-level mixed waste added to the waste storage inventory.	400 m^3 Low-Level Mixed	$652,000
	Idaho National Engineering and Environmental Laboratory: A hazardous nitric acid cleaning process at the Specific Manufacturing Facility was replaced with an environmentally friendly high-pressure water cleaning system. The new system eliminates nitrogen oxide emissions as well as nitric acid safety and disposal concerns. The existing batch of nitric acid was reused in the onsite waste calcining facility.	6 mt Hazardous	$1,000,000
	Pantex Plant: A traditional wet painting process was replaced with a new electrostatic powder paint system. The new process reduces the volatile organic compound emissions by at least 95 percent and eliminates the use of hazardous solvents.	4 mt Hazardous	$255,000
	Kansas City Plant: Boiler and cooling tower blowdown water effluent was rerouted from the Industrial Wastewater Pretreatment Facility directly to the sanitary sewer. This change reduced the production of sludge at the pretreatment facility and reduced chemical usage and disposal costs.	10 mt Hazardous	$56,000

** Assuming one cubic meter is equivalent to one metric ton.*

Table 3.2 Pollution Prevention Source Reduction Projects, 1996
(Continued)

Source Reduction	Accomplishments	Waste Reduction*	Cost Savings
Material Substitution/ Purification	**Argonne National Laboratory-East:** The use of high sulfur coal was eliminated at the site boiler house. This change eliminates the need for the coal scrubber system, thereby avoiding the generation of State regulated hazardous waste.	4,000 mt Hazardous	$214,000
	Fermi National Accelerator Laboratory: Freon 113, utilized in several operations, was replaced with less hazardous solvents. Use of the new solvents eliminates fugitive emissions, reduces waste management costs, and reduces solvent replacement costs.	10 mt Hazardous	$275,000
Procedure Changes/Good Operating Practices	**Oak Ridge National Laboratory:** A site-specific standard was requested which allows the Oak Ridge National Laboratory to leave residual petroleum contamination at three former underground storage tank sites. In all three cases, the cause of contamination has been corrected and all gross contamination removed. This approach, which is acceptable to regulators, eliminates the unnecessary mechanical removal of soil for aeration and pumping of groundwater for external treatment, thereby eliminating the generation of hazardous secondary wastes.	410 mt Hazardous	$1,000,000
	Hanford Site: Administrative controls that keep haul trucks and a front-end loader out of the contamination zone were implemented at the 100-DR-1 and 2 waste sites. Only the bucket of the front-end loader is permitted to enter the contamination zone. This provides easier access for sampling without the need for personnel to enter the contamination zone. The revised procedure reduces step-off pad waste and eliminates the need for decontaminating the equipment when exiting the contamination zone, thereby reducing the generation of low-level radioactive waste.	4 m^3 Low-Level	$8,000
	Los Alamos National Laboratory: Fluorescent bulbs, a designated hazardous waste, were routinely changed based on their expected lifetime inside a radiologically controlled area at TA-55. The change-out schedule was reviewed and modified to allow more operation time between change-outs. The new change-out schedule results in less low-level mixed waste generation.	4 m^3 Low-Level Mixed	$400,000
	Savannah River Site: A program that increased management emphasis on forecasting, training, and employee awareness to reduce waste at the source was initiated. This program has reduced low-level radioactive waste generation.	440 m^3 Low-Level	$711,000

** Assuming one cubic meter is equivalent to one metric ton.*

Table 3.3 Pollution Prevention Segregation Projects, 1996

Segregation	Accomplishments	Waste Reduction*	Cost Savings
Wastestream Segregation/Sorting	**Los Alamos National Laboratory:** During the remediation of an inactive small arms firing range, lead bullets and similar-sized gravel were physically separated from the fine and coarse soil fractions within the contaminated media. The separation operation reduced the total volume of contaminated media that required management as a hazardous wastestream.	5,450 mt Hazardous	$10,910,000
	Battelle Columbus Laboratories: During the removal of radioactively contaminated drain lines, hazardous materials were segregated and managed separately, thus minimizing the generation of low-level mixed waste.	90 m^3 Low-Level Mixed	$4,077,400
	Los Alamos National Laboratory: During the Chemistry Metallurgy Research Facility upgrades, lead soldered joints on copper piping were removed from piping and segregated. This allowed the piping to be disposed as low-level waste instead of as low-level mixed waste. Only the joints themselves were disposed as low-level mixed waste.	16 m^3 Low-Level Mixed	$1,574,800
	Oak Ridge National Laboratory: A scintillation vial crusher was employed to crush activated scintillation vials to allow separation of the hazardous scintillation cocktail from the remainder of the wastestream. This process reduces the amount of waste that must be managed as mixed low-level radioactive waste.	7 m^3 Low-Level Mixed	$131,000
	Portsmouth Gaseous Diffusion Plant: Toxic-, hazardous-, and asbestos-containing materials were separated from radioactive contaminated materials, thereby preventing the generation of low-level mixed waste.	175 m^3 Low-Level Mixed	$22,600,000
Decontamination for Salvage/Recycle	**Hanford Site:** During the 105-N Building deactivation, contaminated material was removed, decontaminated, and released as nonradioactive material for excess. This one-time effort eliminated a source of low-level radioactive waste.	460 m^3 Low-Level	$880,000

** Assuming one cubic meter is equivalent to one metric ton.*

Table 3.3 Pollution Prevention Segregation Projects, 1996
(Continued)

Segregation	Accomplishments	Waste Reduction*	Cost Savings
Decontamination for Salvage/Recycle	**Los Alamos National Laboratory:** Concrete from decommissioning efforts was surveyed for radiological contamination, and areas determined to be contaminated were chipped away to remove all surface contamination. The remaining releasable concrete was crushed using a DOE-owned concrete crusher borrowed from the Idaho National Engineering and Environmental Laboratory. The resulting rubble was reused onsite as fill material, thereby reducing the amount of material disposed as low-level radioactive waste. Reusing the rubble also avoided unnecessary space utilization in the industrial landfill.	690 m^3 Low-Level 3,170 mt Sanitary	$1,200,000
	Los Alamos National Laboratory: During the decontamination and decommissioning of the TA-35 facility, a total of 2,400 lead bricks were removed from the phase separator pit, decontaminated, surveyed for radioactivity, and recycled through a commercial metal recycler. This one-time effort diverted a mixed low-level radioactive waste source from disposal.	2 m^3 Low-Level Mixed 30 mt Hazardous	$928,000
Survey for Free Release	**East Tennessee Technology Park:** Several materials were successfully surveyed for free-release during the Cooling Tower Demolition Project, thus avoiding the need to dispose of them as low-level mixed waste. Scrap metal was free-released for recycling, concrete rubble was reused as excavation fill material, and wastewater was used for local vegetation irrigation.	9,100 m^3 Low-Level Mixed	$3,500,000
	Pantex Plant: The demilitarization and sanitation of high explosive components from the dismantlement of weapons produces a tungsten oxide ash that was disposed as low-level radioactive waste. The ash is now surveyed to prove it is not radioactively contaminated, and is transferred to the Oak Ridge National Laboratory, where tungsten is being used as a replacement for lead in bullets. The tungsten oxide ash is easily reduced back into tungsten suitable for bullet production. The ash is transferred to the Oak Ridge National Laboratory using DOE-chartered trucking on a space-available basis, which eliminates transportation costs. This effort eliminates the disposal of a low-level radioactive waste from the Pantex Plant, and reduces the amount of tungsten that the Oak Ridge National Laboratory has to purchase.	3 m^3 Low-Level	$89,000
	Savannah River Site: A site-wide protocol, known as "Green-is-Clean," was initiated in approximately 40 facilities to allow Radiological Buffer Area waste to be managed as sanitary waste instead of as low-level radioactive waste. This program resulted in a 15 percent site-wide reduction in low-level radioactive waste generation.	1,470 m^3 Low-Level	$2,800,000

** Assuming one cubic meter is equivalent to one metric ton.*

Table 3.4 Pollution Prevention Recycle/Reuse Projects, 1996

Recycle/Reuse	Accomplishments	Waste Reduction*	Cost Savings
Beneficial Use/Reuse Onsite	**Hanford Site:** A site-wide materials management program promotes the reuse of various materials onsite rather than disposing of them as hazardous waste. This recycling effort avoided waste disposal and material replacement costs.	105 mt Hazardous	$1,020,000
	Argonne National Laboratory-East: Fifty shield blocks from the 317 Area were used onsite as fill material, thus avoiding disposal and procurement costs.	100 m^3 Low-Level	$500,000
	Hanford Site: Various types of equipment (e.g., trucks, cranes, gas cylinders, etc.) that were decontaminated at the 2706T Plant facility were reused onsite when practical. Reuse of the decontaminated equipment avoided waste disposal and equipment replacement costs.	310 m^3 Low-Level	$585,000
	Hanford Site: Decontaminated tank farm auger parts were reused, thus avoiding waste disposal and equipment replacement costs.	210 m^3 Low-Level Mixed	$2,925,600
Beneficial Use/Reuse Offsite	**Energy Technology Engineering Center:** Sodium from process drain tanks at the Energy Technology Engineering Center was transferred to a chemical company for use in pharmaceutical product manufacturing, avoiding hazardous waste disposal.	65 mt Hazardous	$755,000
	East Tennessee Technology Park: Radioactive scrap metal generated from an environmental restoration project which repackaged 31,954 drums containing waste sludge from the K-25 B and C Ponds, was sent to Scientific Ecology Group for smelting into shielding blocks. The shield blocks will be used by DOE. This effort eliminated low-level radioactive waste from disposal.	70 m^3 Low-Level	$118,300
	Hanford Site: Unused uranium billets from the fabrication of fuel for the N reactor were sold to British Nuclear Fuels, Ltd., thus avoiding the need to dispose of them as low-level radioactive waste.	40 m^3 Low-Level	$577,000
	Hanford Site: Concrete from the demolition of the 109-D Facility was crushed and reused for roadbed material and clean backfill. The reuse of this material avoided unnecessary space utilization in the industrial landfill.	1,500 mt Sanitary	$52,500

** Assuming one cubic meter is equivalent to one metric ton.*

Table 3.4 Pollution Prevention Recycle/Reuse Projects, 1996
(Continued)

Recycle/Reuse	Accomplishments	Waste Reduction*	Cost Savings
Beneficial Use/Reuse Offsite	**Pacific Northwest National Laboratory:** Obsolete software and software documentation were sent offsite. The diskettes were degaussed and reformatted for resale, and the scrap paper from the packaging and documentation was recycled. This reduced the amount of sanitary waste requiring disposal.	15 mt Sanitary	$25,000
	Idaho National Engineering and Environmental Laboratory: A paper pelletizer was constructed to convert waste paper into fuel for the Idaho National Engineering and Environmental Laboratory Coal Fired Steam Generation Facility. During the initial phase of operation, 400 metric tons of sanitary waste were eliminated from disposal. Full-scale operation is expected to yield an estimated annual savings of $1,646,000 in waste disposal costs and reduced fuel costs.	400 mt Sanitary	$11,000
	Pacific Northwest National Laboratory: A laboratory equipment pool that redistributed reusable scientific, office, and electronic equipment and tools was established. This effort eliminated sanitary waste, and saved disposal and equipment replacement costs.	50 mt Sanitary	$1,000,000
	Lawrence Berkeley National Laboratory: Lightly activated concrete shielding blocks were shipped to Brookhaven National Laboratory for reuse in the Relativistic Heavy Ion Collider thus avoiding the need to dispose of them. This effort eliminated a potential source of low-level radioactive waste.	4,950 m^3 Low-Level	$2,000,000
	Sandia National Laboratories/New Mexico: A Solid Waste Transfer Facility was implemented to maximize the recycling and proper management of solid wastes. This facility removed paper and cardboard from the solid wastestream and baled it for sale to an offsite recycler, thereby reducing the generation of sanitary waste.	567 mt Sanitary	$100,000
Material Exchange/ Clearinghouse	**Savannah River Site:** Excess chemicals were eliminated from disposal as hazardous waste through reuse onsite, returning them to the manufacturer, or donating them to local entities.	30 mt Hazardous	$500,000
	Hanford Site: Used tires were traded for new or recap tires by an offsite vendor through a closed loop recycling program. This practice eliminated spent tires from being placed in a landfill.	50 mt Sanitary	$13,200
PPE Laundering/ Reuse	**Fernald Environmental Management Project:** Washable Anti-C's were transported to and from radiologically controlled areas in reusable bags. The bags are washed along with the clothing, thus allowing for reuse.	70 m^3 Low-Level	$46,000

** Assuming one cubic meter is equivalent to one metric ton.*

Chapter 4.0 Operations/Field Office Pollution Prevention Progress

This chapter presents waste generation and pollution prevention accomplishments by each of the DOE Operations/Field Offices, and by the group of sites that report directly to DOE Headquarters. There are 10 Operations/Field Offices within the DOE complex: Albuquerque, Chicago, Idaho, Nevada, Oakland, Oak Ridge, Ohio, Richland, Rocky Flats, and Savannah River. All 10 Operations/Field Offices plus Headquarters oversee sites that reported radioactive, hazardous, and sanitary waste generation in 1996 (Tables 4.1 and 4.2).

Albuquerque, Idaho, Oak Ridge, and Richland represent the Operations/Field Offices that generated most of the waste in 1996. These Operations/Field Offices also were among the top contributors to cost savings within the complex in 1996.

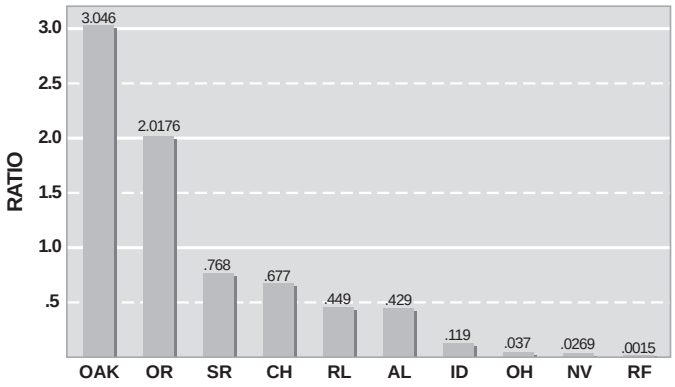
Cost Savings in CY 1996

Operations/Field Office	Total Cost Savings
Albuquerque	$42,000,000
Chicago	$2,100,000
Idaho	$2,200,000
Nevada	$484,000
Oakland	$4,900,000
Oak Ridge	$35,300,000
Ohio	$4,400,000
Richland	$17,600,000
Rocky Flats	$66,000
Savannah River	$17,400,000
Headquarters	$557,000
TOTAL:	**$127 million**

A method to assess individual Operations/Field Office performance involves the use of a simple ratio comparing the amount of waste avoided to waste generated. This ratio provides an indication of pollution prevention program effectiveness in direct relation to waste generation, thereby giving a truer assessment of performance.

The reported amounts of waste avoided resulting from the implementation of pollution prevention projects for low-level radioactive, low-level mixed, and hazardous wastes were summed for each Operations/Field Office. These totals were compared to the reported amounts of total (routine operations and cleanup/stabilization) low-level radioactive, low-level mixed, and hazardous wastes generated in 1996 by each of the Operations/Field Offices.

Figure 4.1 Ratio of Waste Avoided to Total Waste Generated, 1996



The ratio suggests how aggressively an Operations/Field Office is addressing waste generation through the implementation of pollution prevention efforts. A high ratio is indicative of a successful program with substantial pollution prevention implementation. Based on the 1996 data depicted in Figure 4.1, the Oakland and Oak Ridge Operations/Field Offices have the highest ratios. On the other hand, the Ohio, Nevada, and Rocky Flats Operations/Field Offices have the lowest ratios.

Table 4.1 1996 Routine Operations Waste Generation by Operations/Field Office and Waste Type
(in Cubic Meters*)

Operations Office	High-Level	Transuranic	Low-Level Radioactive	Low-Level Mixed	Hazardous*	Sanitary*
Albuquerque	0	81	730	31	570	10,582
Chicago	0	8	1,054	12	1,466	3,350
Idaho	291	0	1,747	110	38	4,213
Nevada	0	0	0	0	78	5,227
Oakland	0	8	119	29	507	5,333
Oak Ridge	0	8	1,820	344	18	40,787
Ohio	0	0	1,849	14	183	1,768
Richland	0	2	1,328	328	75	1,389
Rocky Flats	0	30	622	51	23	10,268
Savannah River	2,379	165	5,779	452	57	2,780
Headquarters	0	0	0	0	138	3,341
TOTAL	**2,670**	**302**	**15,048**	**1,371**	**3,153**	**89,038**

** Assuming one cubic meter is equivalent to one metric ton.*

Table 4.2 1996 Cleanup/Stabilization Waste Generation by Operations/Field Office and Waste Type
(in Cubic Meters*)

Operations Office	High-Level**	Transuranic	Low-Level Radioactive§	Low-Level Mixed§	Hazardous*	Sanitary*
Albuquerque	0	57	4,706	355	14,561	6,179
Chicago	0	0	1,348	5	13,287	0
Idaho	0	0	403	38	190	28,474
Nevada	0	0	1,598	3	473	0
Oakland	0	0	545	29	531	5,558
Oak Ridge	0	1	2,222§	1,016§	28	14,018
Ohio	0	30	21,058	253	0	1,289
Richland	0	88	31,956	184	751	2,537
Rocky Flats	0	26	312	239	39	25
Savannah River	0	0	820	15	10	3,295
Headquarters	0	0	0	0	31	13,783
TOTAL	**0**	**202**	**64,968**	**2,137**	**29,901**	**75,158**

** Assuming one cubic meter is equivalent to one metric ton.*

*** No high-level waste was generated in the cleanup/stabilization waste category.*

§ Excludes 11e(2) byproduct material (soil or other material contaminated by extraction or concentration or uranium or thorium). The only site reporting byproduct material in 1996 was the Weldon Spring Site Remedial Action Project, which includes 473,100 cubic meters of low-level radioactive waste and 130 cubic meters of low-level mixed waste.

Recycling

Approximately 67 percent of the pollution prevention projects reported in 1996 involved recycling activities. Recycling activities are traditionally associated with sanitary waste, however, the radioactive and hazardous waste categories are also amenable to reduction via recycling. Fifty-five percent of the recycling projects reported in 1996 reduced sanitary waste. By contrast, 10 percent and 33 percent of the recycling projects reduced radioactive and hazardous waste, respectively. Example recycling projects were listed in Table 3.4. A breakdown of the materials recycled in 1996 is presented in Table 4.3.

- Paper Products - office paper, corrugated cardboard, newspaper, phone books.
- Scrap Metals - stainless steel, copper, iron, aluminum, lead, zinc, and other types of metals not clarified.
- Precious Metals - silver, gold, platinum, and other types of metals not clarified.
- Automotive - batteries, engine oils, and tires.
- Other - aluminum cans, glass, plastic, styrofoam, toner cartridges, food waste, concrete, wood, and any other items that do not fit into the previous categories.

Table 4.3 1996 DOE Recycling Activities by Operations/Field Office
(in Metric Tons)

Operations Office	Paper Products	Metals	Automotive	Other[a]	(Other Explanation)	TOTAL[b]
Albuquerque	1,015	2,456	219	7,828	Engine coolant, copper etchant, antifreeze, electronic components, fluorescent light tubes	11,518
Chicago	1.038	2,507	72	10,589	Lime sludge, asphalt, ethylene glycol, concrete, wood, electronic equipment	14,206
Idaho	272	576	82	3	Mercury containing fluorescent tubes	933
Nevada	288	1,839	67	6		2,200
Oakland	719	2,628	44	17,867	Asphalt, soil, hazardous material, copper wire	21,258
Oak Ridge	990	1,656	38	19,084	Concrete, wood, fly ash, antifreeze, fluorescent bulbs	21,768
Ohio	330	185	39	151		705
Richland	682	3,114	144	10,940	Electrical equipment, fluorescent tubes, software	14,880
Rocky Flats	210	657	<0.5	1		868
Savannah River	708	1,994	33	16		2,751
Headquarters	64	497	14	2,676	Wood, mineral oil, solvent, concrete	3,251
TOTAL	**6,316**	**18,109**	**752**	**69,161**		**94,338**

[a] *Other materials may include: plastic, styrofoam, glass, toner cartridges, food/garden waste, concrete, wood, fluorescent light tubes, coolant, filters, solvents, photographic materials, ground circuit boards, chemicals, small animal exposure tubes, paint, adhesives, brick, non-process wastewater, furniture/office equipment, and fly ash.*

[b] *Quantities are **estimates** that have been rounded to the nearest whole number, assuming that one cubic meter is equivalent to one metric ton. Materials sent offsite for handling to be recycled by another party are **not** included in these estimates.*

4.1 Albuquerque Operations Office

The Albuquerque Operations Office provides field level Federal management to assure effective, efficient, safe, and secure accomplishment of DOE's national defense, environmental quality, science and technology, technology transfer and commercialization, and national energy objectives.

4.1.1 Performance Measures

In 1996, more than 18,000 cubic meters of waste were avoided at the Albuquerque Operations Office's seven reporting sites due to pollution prevention practices (Figure 4.2). As a result, the Albuquerque Operations Office saved more than $42 million by implementing pollution prevention projects.

Achievements CY 1996

Number of P2 Projects:	112
Total Waste Reduced:	18,200 cubic meters
Cost Savings:	$42 million

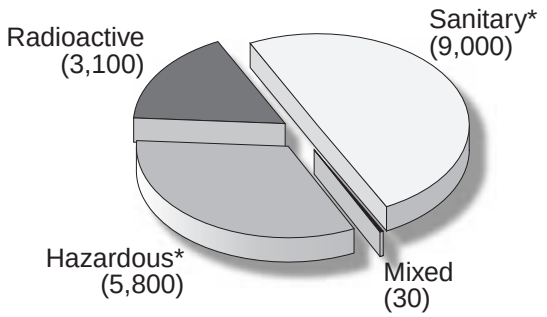
Category	Performance Measure	Goal
Radioactive Waste	68% reduction	50%
Mixed Waste	45% reduction	50%
Hazardous Waste	77% reduction	50%
Sanitary Waste	51% reduction	33%
Recycling	41% recycled	33%
Affirmative Procurement	67% purchased	100%

4.1.2 Pollution Prevention Accomplishments

The Albuquerque Operations Office conducted 112 pollution prevention projects in 1996, accounting for about 14 percent of the waste reduction within the DOE complex (Table 4.4). Projects include:

- **Kansas City Plant** rerouted the boiler and cooling tower blowdown water effluent from the Industrial Wastewater Pretreatment Facility directly to the sanitary sewer. This change reduced the production of sludge at the pretreatment facility thereby eliminating about 10 metric tons of hazardous waste and saved $56,000 in reduced chemical usage and disposal costs.

Figure 4.2 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

- **Los Alamos National Laboratory** physically separated lead bullets and similar-sized gravel from contaminated soil during the remediation of an inactive small arms firing range. The separation operation reduced the total volume of contaminated media requiring management as a hazardous wastestream by about 5,500 metric tons and saved about $11 million.

Table 4.4 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Inhalation Toxicology Research Institute; Albuquerque, NM	4	15	$23.3
Kansas City Plant; Kansas City, MO	6	90	$119
Los Alamos National Laboratory; Los Alamos, NM	70	17,400	$40,000
Pantex Plant; Amarillo, TX	16	40	$1,600
Sandia National Laboratories/ California; Livermore, CA	2	20	$9
Sandia National Laboratories/ New Mexico; Albuquerque, NM	14	600	$411
Waste Isolation Pilot Plant; Carlsbad, NM	–	–	–

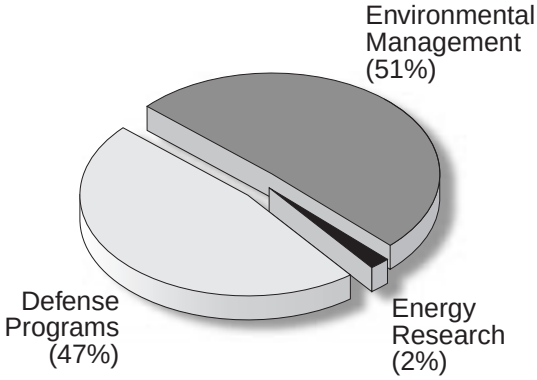
- **Pantex Plant** replaced a traditional wet painting process with a new electrostatic powder paint system. The new process reduced the volatile organic compound emissions by at least 95 percent and eliminated the use of hazardous solvents. This modification eliminated about four metric tons of hazardous waste and saved $255,000.

- **Sandia National Laboratories/New Mexico** implemented a Solid Waste Transfer Facility to maximize the recycling, and to ensure proper management, of solid wastes. This facility removed paper and cardboard from the solid wastestream and baled it for sale to an offsite recycler, thereby eliminating about 570 metric tons of sanitary waste and saving $100,000.
- **Los Alamos National Laboratory** implemented a comprehensive waste minimization initiative aimed at reducing Radiological Control Areas, improving procedures for waste type verification, and managing suspect radioactive material. This effort reduced about 60 cubic meters of low-level radioactive waste and about 30 cubic meters of transuranic waste and saved a total of about $3.5 million.

4.1.3 Waste Generation

Albuquerque Operations Office reporting sites generated about 38,000 cubic meters of waste in 1996, approximately 13 percent of the DOE complex-wide waste generation total. Sanitary waste generation of about 17,000 metric tons constituted 44 percent of all waste generated by this operations office, and 10 percent of all sanitary waste generated by the DOE complex. The waste generated by the Albuquerque Operations Office in 1996 was mainly attributed to the Program Offices of Defense Programs and Environmental Management (Figure 4.3).

Figure 4.3 1996 Waste Generation by Cognizant Secretarial Office

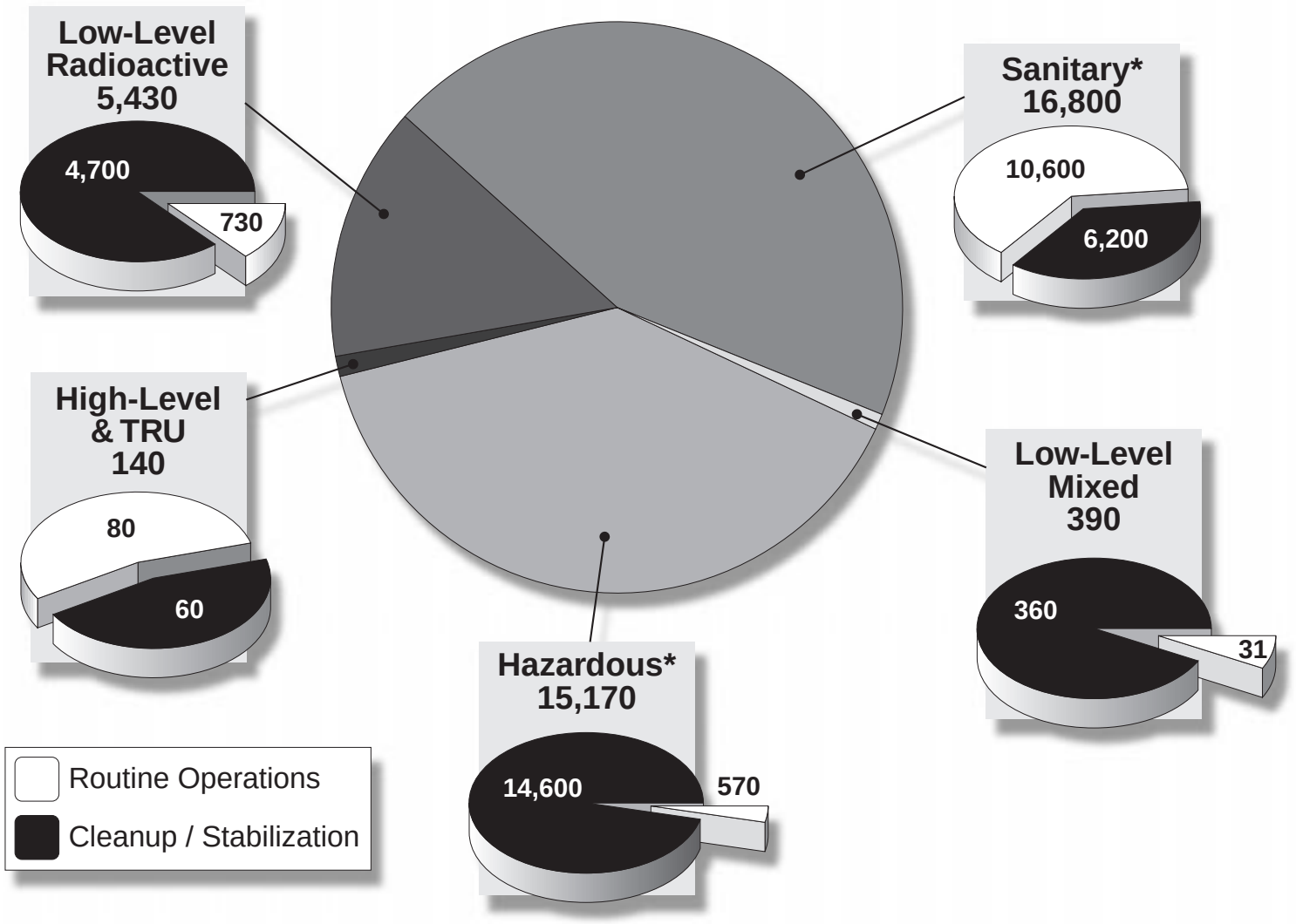


In 1996, Albuquerque Operations Office reporting sites generated about 140 cubic meters of transuranic waste, approximately 27 percent of the DOE complex-wide total for this waste type (Figure 4.4). All of the transuranic waste was generated at the Los Alamos National Laboratory. The increase in transuranic waste from 1995 to 1996 resulted from construction upgrades at the Chemistry, Metallurgy Research Facility and refurbishment and equipment cleanout activities at the TA-55 Plutonium Facility.

Only a small quantity of low-level mixed waste was generated in 1996 (386 cubic meters). Hazardous waste generation increased from 1995 reported amounts due to increased environmental restoration activities at the Kansas City Plant, Los Alamos National Laboratory, and Pantex Plant.

Figure 4.4 Albuquerque Operations Office Waste Generation, 1996

(in Cubic Meters)*



* Assuming one cubic meter is equivalent to one metric ton.

4.2 Chicago Operations Office

The Chicago Operations Office is responsible for energy research, development, and construction, including administration of operating contracts for five of the Nation's major government-owned laboratories. The DOE Lead Program Office for these sites is Energy Research, except for the Argonne National Laboratory-West, which is managed by the Office of Nuclear Energy.

4.2.1 Performance Measures

In 1996, more than 17,000 cubic meters of waste were avoided at the Chicago Operations Office's five reporting sites due to pollution prevention activities. Argonne National Laboratory-East alone was able to reduce over 11,000 cubic meters of hazardous waste and more than 100 cubic meters of low-level waste (Figure 4.5). As a result, the Chicago Operations Office was successful in saving more than $2 million by implementing the pollution prevention projects at its five reporting sites. Argonne National Laboratory-East accounts for more than half of the total and Fermi accounts for about 25 percent of the Operation total.

Achievements CY 1996

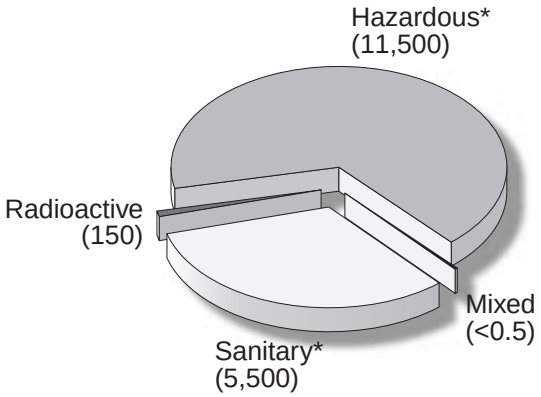
Number of P2 Projects:	36
Total Waste Reduced:	17,100 cubic meters
Cost Savings:	$2.1 million

Category	Performance Measure	Goal
Radioactive Waste	22% reduction	50%
Mixed Waste	92% reduction	50%
Hazardous Waste	62% reduction	50%
Sanitary Waste	45% reduction	33%
Recycling	81% recycled	33%
Affirmative Procurement	26% purchased	100%

4.2.2 Pollution Prevention Accomplishments

The Chicago Operations Office conducted 36 pollution prevention projects in 1996, accounting for 13 percent of the waste reduction within the DOE complex (Table 4.5). Projects include:

Figure 4.5 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

- **Argonne National Laboratory-East** diverted soil from several construction and remediation projects and reused it as fill material for other projects on site. This effort avoided 1,500 metric tons of hazardous waste from disposal and saved $10,000.
- **Argonne National Laboratory-East** eliminated the use of high sulfur coal at the site boiler house, thereby eliminating the need for the coal scrubber system. This process change avoids the generation of 4,000 metric tons of state regulated hazardous waste annually, with a savings of $200,000.

Table 4.5 1996 Pollution Prevention Accomplishments by Site

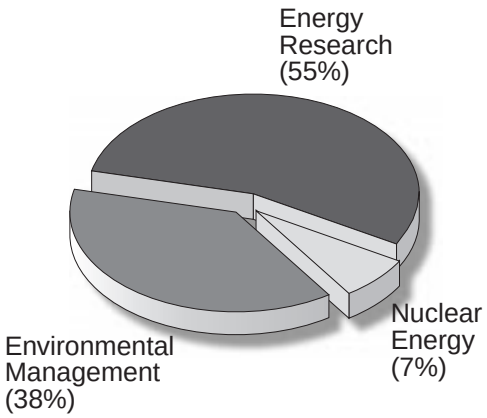
Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Argonne National Laboratory–East; Argonne, IL	16	12,600	$1,100
Argonne National Laboratory–West; Idaho Falls, ID	3	4	$9
Brookhaven National Laboratory; Upton, NY	2	6	$5
Fermi National Accelerator Laboratory; Batavia, IL	5	4,300	$600
Princeton Plasma Physics Laboratory; Princeton, NJ	10	150	$320

- **Brookhaven National Laboratory** substituted an ultrasonic cleaning system utilizing detergents and weak acids in place of acid etching baths containing hydrofluoric and nitric acids in the cleaning operations for Ultra High Vacuum System components. The new process generates no hazardous wastes, thereby eliminating 0.7 metric tons of hazardous waste and saving $5,000 annually.
- **Fermi National Accelerator Laboratory** replaced Freon 113, utilized in several operations, with less hazardous solvents. Use of the new solvents eliminates fugitive emissions, eliminates almost 10 metric tons of hazardous waste, and saves $280,000 annually in waste management and solvent replacement costs.
- **Princeton Plasma Physics Laboratory** invented a tritium filter, known as "Big Bubbler," which removes tritium from the air and concentrates it in a drum for eventual recycling. The filter was employed to remove tritium from the off-gassing of the Tokamak Fusion Test Reactor during a recent outage, eliminating over six cubic meters of low-level radioactive waste and saving $100,000.

4.2.3 Waste Generation

In 1996, the Chicago Operations Office's five sites generated approximately 21,000 cubic meters of waste, which represents about seven percent of the DOE complex-wide waste generation total. The waste generated by the Chicago Operations Office in 1996 was mainly attributed to the Program Offices of Environmental Management and Energy Research (Figure 4.6). The Chicago Operations Office was the second largest generator of hazardous waste in 1996, accounting for 45 percent of the total (routine operations plus cleanup/stabilization) for this waste type (Figure 4.7). However, this Operations Office also reported the largest reduction in the generation of hazardous waste from routine operations in 1996 when compared to 1993 levels.

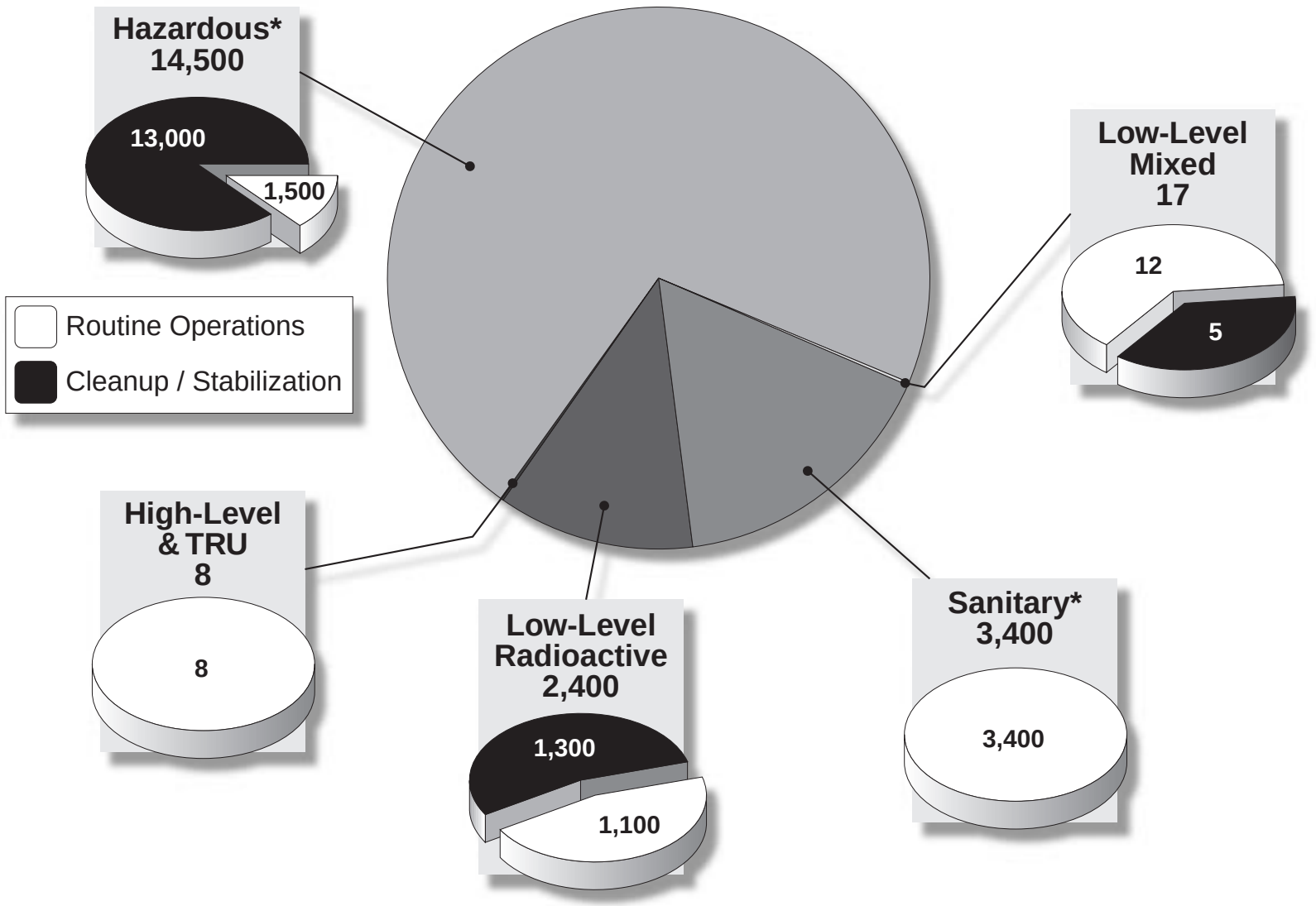
Figure 4.6 1996 Waste Generation by Cognizant Secretarial Office



For 1996, low-level radioactive and hazardous waste generation increased from 1995 reported amounts. Low-level radioactive waste generation increased due to construction and demolition activities at the Brookhaven National Laboratory. Increased restoration activities at Argonne National Laboratory-East generated large quantities of derived waste, contaminated soil, and contaminated water which contributed to the increase in hazardous waste.

Figure 4.7 Chicago Operations Office Waste Generation, 1996

(in Cubic Meters*)



* Assuming one cubic meter is equivalent to one metric ton.

4.3 Idaho Operations Office

The Idaho Operations Office is responsible for the administration and management of assigned programs, alternate energy technology development and demonstration projects, chemical processing operations and demonstration, environmental restoration and waste management operations, and nuclear reactor safety research, development, and demonstration.

4.3.1 Performance Measures

In 1996, about 1,000 cubic meters of waste were avoided at the Idaho Operations Office's one reporting site due to pollution prevention activities. As a result, the Idaho Operations Office was successful in saving more than $2 million by implementing pollution prevention projects (Figure 4.8).

Achievements CY 1996

Number of P2 Projects:	7
Total Waste Reduced:	1,000 cubic meters
Cost Savings:	$2.2 million

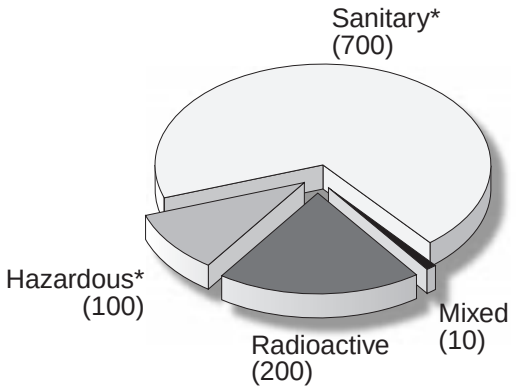
Category	Performance Measure	Goal
Radioactive Waste	43% reduction	50%
Mixed Waste	307% increase	50%
Hazardous Waste	94% reduction	50%
Sanitary Waste	7% reduction	33%
Recycling	3% recycled	33%
Affirmative Procurement	62% purchased	100%

4.3.2 Pollution Prevention Accomplishments

The Idaho Operations Office conducted seven pollution prevention projects in 1996, accounting for less than one percent of the waste reduction within the DOE complex (Table 4.6). Projects include:

- **Idaho National Engineering and Environmental Laboratory** recovered lead metal from ten dismantled casks at the Test Area North facility. This effort eliminated about 90 metric tons of hazardous waste and saved about $600,000.

Figure 4.8 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

- **Idaho National Engineering and Environmental Laboratory** replaced a hazardous nitric acid cleaning process at the Specific Manufacturing Facility with an environmentally friendly high-pressure water cleaning system. The new system eliminates nitrogen oxide emissions as well as nitric acid safety and disposal concerns. The existing batch of nitric acid was reused in the onsite waste calcining facility. This effort eliminated about six metric tons of hazardous waste and provided an annual savings of $1 million.

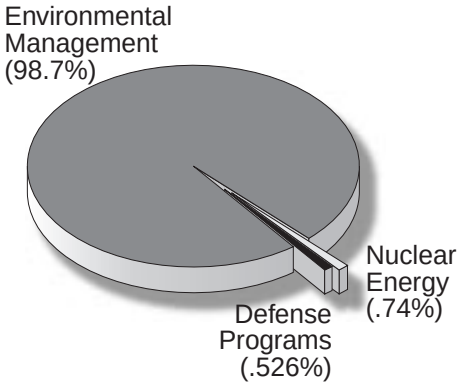
Table 4.6 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Idaho National Engineering and Environmental Laboratory; Idaho Falls, ID	7	1,000	$2,200

- **Idaho National Engineering and Environmental Laboratory** constructed a paper pelletizer to convert waste paper into fuel for the Idaho National Engineering and Environmental Laboratory Coal Fired Steam Generation Facility. During the initial phase of operation, disposal of 400 metric tons of sanitary waste was eliminated, with a savings of about $11,000. Full-scale operation is expected to yield an estimated annual savings of $1.6 million in waste disposal costs and reduced fuel costs.

- **Idaho National Engineering and Environmental Laboratory** replaced single-use, prefabricated wood and nylon tents with reusable steel framed and polyvinylchloride fabric tents. The new tents are decontaminated and reused, thus reducing the amount of low-level radioactive waste for disposal. This effort eliminated about 200 cubic meters of low-level radioactive waste and saved about $200,000.

Figure 4.9 1996 Waste Generation by Cognizant Secretarial Office



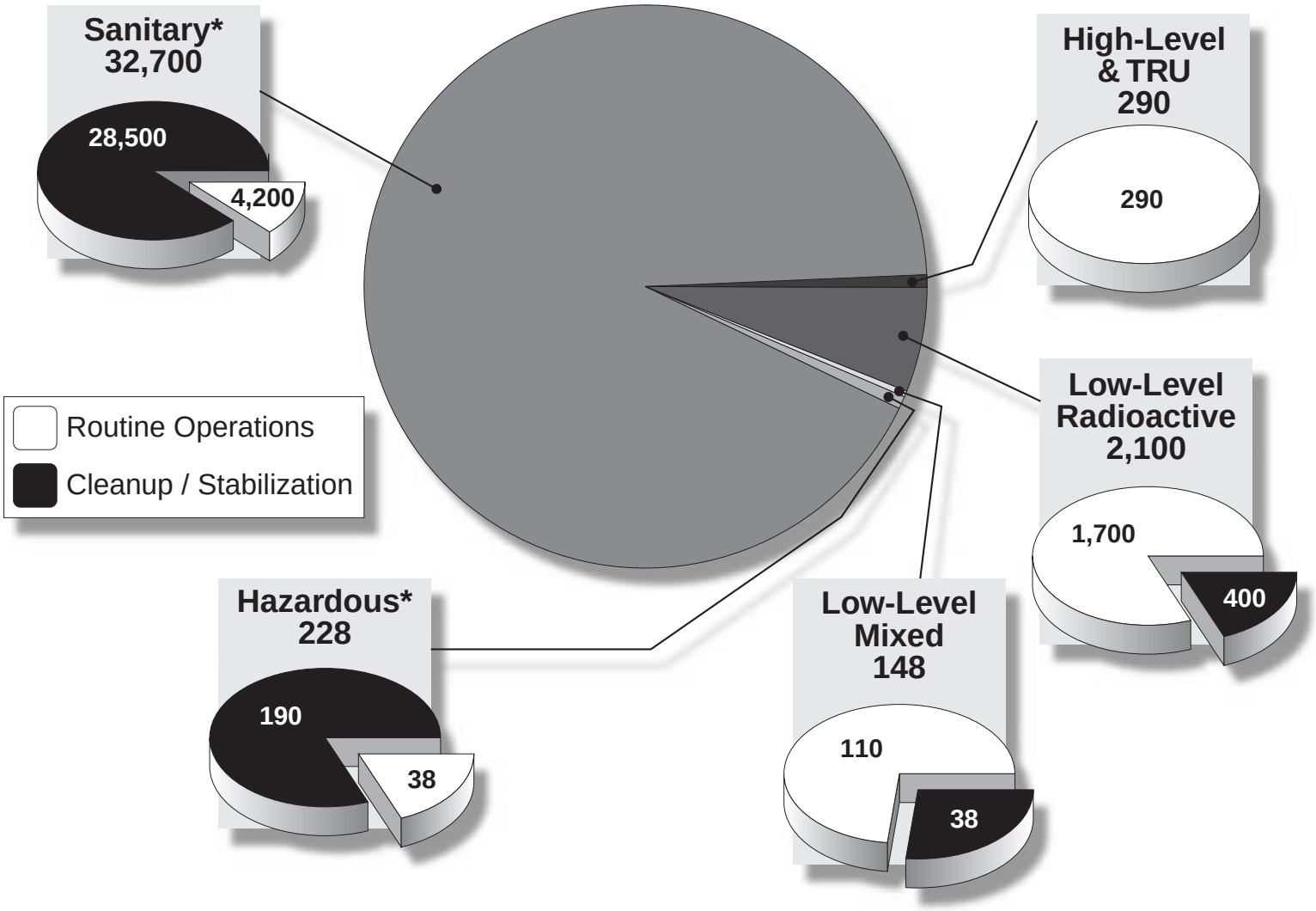
4.3.3 Waste Generation

The majority of the waste generated by the Idaho Operations Office in 1996 was attributed to the Environmental Management Program (Figure 4.9). In 1996, Idaho Operations Office reporting sites generated about 35,500 cubic meters of waste, approximately 13 percent of the DOE complex-wide waste generation total (Figure 4.10). The wastes generated were primarily low-level radioactive and sanitary waste.

For 1996, high-level waste generation increased from 1995 reported amounts due to decontamination and maintenance operations. Low-level mixed waste generation increased as a result of fly ash, personal protective equipment waste, and compaction operations from the Waste Environmental Reduction Facility. Hazardous waste generation increased due to decommissioning operations including large quantities of asbestos containing debris.

Figure 4.10 Idaho Operations Office Waste Generation, 1996

(in Cubic Meters)*



* Assuming one cubic meter is equivalent to one metric ton.

4.4 Nevada Operations Office

The Nevada Operations Office provides support for national security, crisis management, energy, environmental management, science and technology development, and environmental cleanup in the Pacific area.

4.4.1 Performance Measures

In 1996, about 1,200 cubic meters of waste were avoided at the Nevada Operations Office's two reporting sites due to pollution prevention activities (Figure 4.11). As a result, the Nevada Operations Office was successful in saving $484,000 by implementing pollution prevention projects.

Achievements CY 1996

Number of P2 Projects:	25
Total Waste Reduced:	1,200 cubic meters
Cost Savings:	$484,000

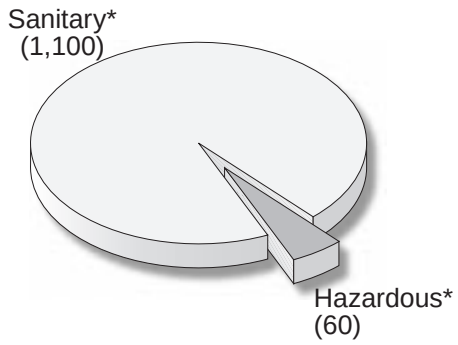
Category	Performance Measure	Goal
Hazardous Waste	98% reduction	50%
Sanitary Waste	62% reduction	33%
Recycling	30% recycled	33%
Affirmative Procurement	50% purchased	100%

4.4.2 Pollution Prevention Accomplishments

The Nevada Operations Office conducted 25 pollution prevention projects in 1996, accounting for less than one percent of the waste reduction within the DOE complex (Table 4.7). Projects include:

- The **North Las Vegas Facility** contracted with a vendor to pick up used batteries at the site for recycling. This effort eliminated about six metric tons of hazardous waste from disposal and saved about $2,500.
- **Nevada Test Site** diverted scrap metal from the landfill by conducting salvage sales. This recycling effort eliminated about 500 metric tons of sanitary waste and saved about $200,000.
- **Nevada Test Site** installed an oil skimmer system to collect oil for recycling. This system reduced the amount of oil sent offsite for disposal. This effort eliminated approximately one metric ton of hazardous waste and saved about $8,000.
- The **North Las Vegas Facility** replaced photo processing chemicals, which contained formaldehyde free liquids, with a less hazardous solution and optimized the color printer by substituting a new paper. These modifications eliminated about one metric ton of hazardous waste and provided a savings of about $60,000.

Figure 4.11 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

Table 4.7 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Nevada Test Site; Mercury, NV	10	720	$292
North Las Vegas Facility; North Las Vegas, NV	15	460	$192

4.4.3 Waste Generation

The majority of the waste generated by the Nevada Operations Office in 1996 was attributed to Defense Programs (Figure 4.12). In 1996, Nevada Operations Office reporting sites generated about 7,400 cubic meters of waste, contributing approximately three percent of the DOE complex-wide waste generation total (Figure 4.13).

Low-level waste generation increased in 1996 from 1995 reported amounts, whereas, the generation of all other waste types decreased. The increase was due to remediation activity at Nevada Test Site.

Figure 4.12 1996 Waste Generation by Cognizant Secretarial Office

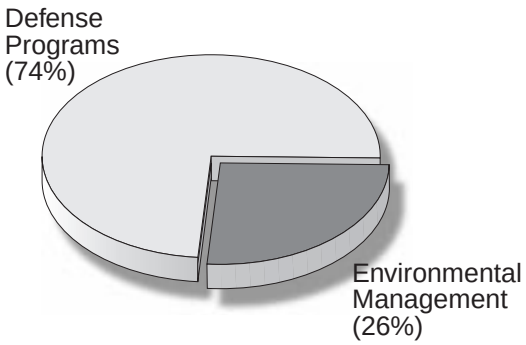
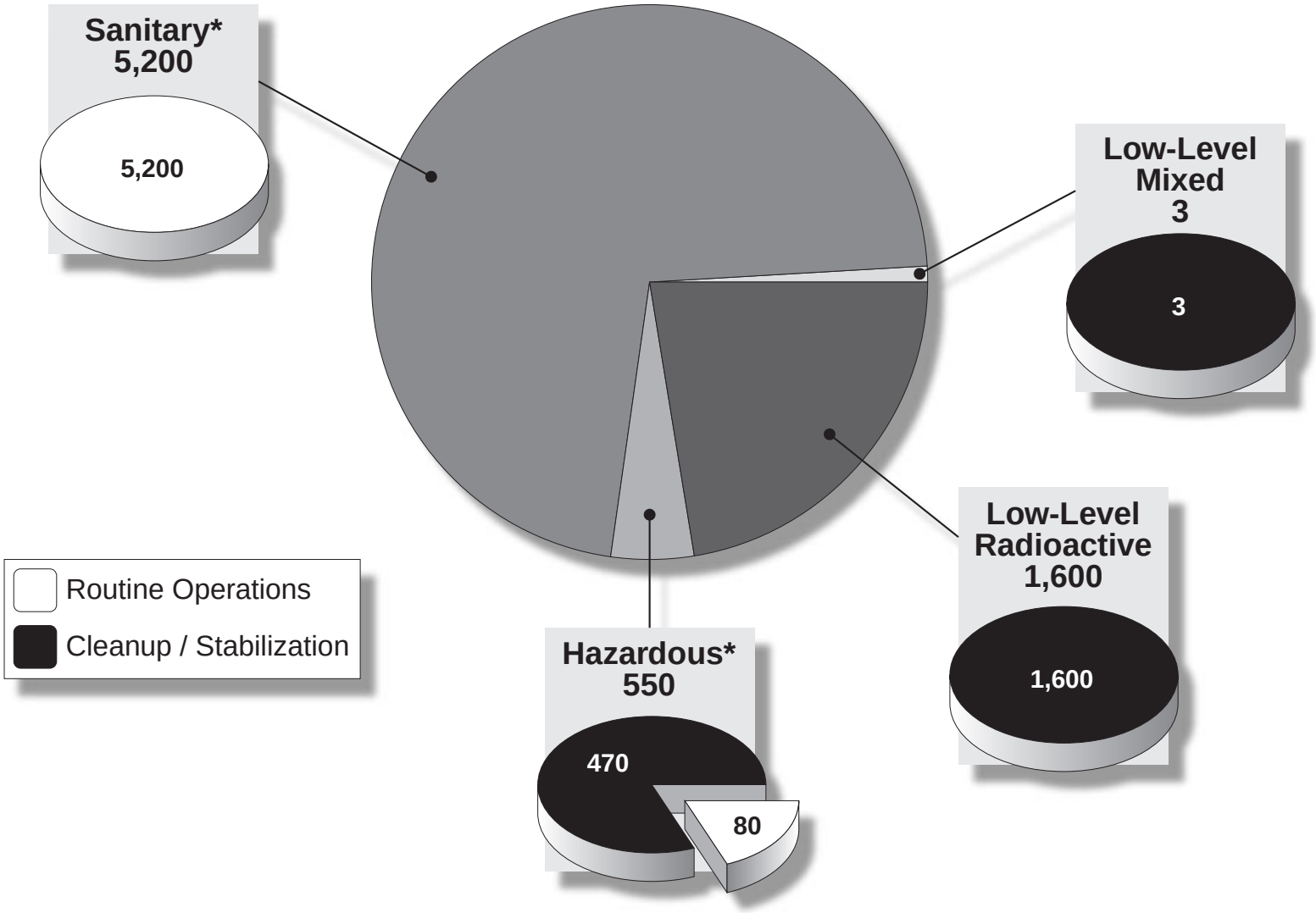


Figure 4.13 Nevada Operations Office Waste Generation, 1996

(in Cubic Meters*)



* Assuming one cubic meter is equivalent to one metric ton.

4.5 Oakland Operations Office

The Oakland Operations Office serves the public by managing world-class national research and development facilities, and by administering contracts to achieve DOE's program goals and priorities.

4.5.1 Performance Measures

In 1996, more than 25,000 cubic meters of waste were avoided at the Oakland Operations Office's four reporting sites due to pollution prevention activities. As a result, the Oakland Operations Office was successful in saving about $5 million by implementing pollution prevention projects (Figure 4.14).

Achievements CY 1996

Number of P2 Projects:	49
Total Waste Reduced:	25,300 cubic meters
Cost Savings:	$4.9 million

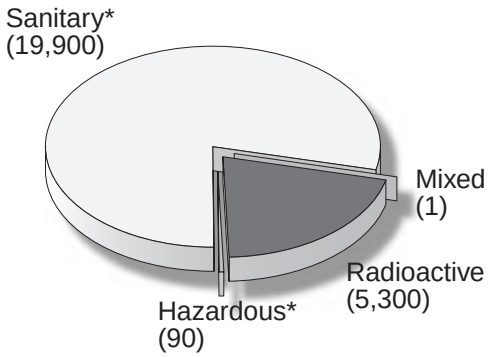
Category	Performance Measure	Goal
Radioactive Waste	39% reduction	50%
Mixed Waste	70% reduction	50%
Hazardous Waste	47% reduction	50%
Sanitary Waste	49% reduction	33%
Recycling	66% recycled	33%
Affirmative Procurement	67% purchased	100%

4.5.2 Pollution Prevention Accomplishments

The Oakland Operations Office conducted 49 pollution prevention projects in 1996, accounting for about 19 percent of the waste reduction within the DOE complex (Table 4.8). Projects include:

- **Energy Technology Engineering Center** transferred sodium from process drain tanks to a chemical company for use in pharmaceutical product manufacturing. This avoided 65 metric tons of hazardous waste from disposal and saved $755,000.
- **Lawrence Berkeley National Laboratory** shipped lightly activated concrete shielding blocks to Brookhaven National Laboratory for reuse in the Relativistic Heavy Ion Collider, thus avoiding the need to dispose of them. This effort eliminated about 5,000 cubic meters of low-level radioactive waste and saved $2 million.
- **Lawrence Livermore National Laboratory** incorporated improved operating procedures that reduced the use of plastic booties in the B612 and B514 yards, thereby reducing the amount of protective clothing waste generated by waste management activities. This effort eliminated about one metric ton of hazardous waste and saved $37,500.

Figure 4.14 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

Table 4.8 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Energy Technology Engineering Center; Canoga Park, CA	7	360	$1,000
Lawrence Berkeley National Laboratory; Berkeley, CA	20	5,300	$2,700
Lawrence Livermore National Laboratory; Livermore, CA	17	19,500	$1,200
Stanford Linear Accelerator Center; Stanford, CA	5	110	$30

- **Stanford Linear Accelerator Center** installed pressure gauges on plating baths, thereby extending the useful life of the bath filters. This process modification reduced hazardous waste generation by about 0.5 metric tons and saved $2,300.

4.5.3 Waste Generation

The waste generated by the Oakland Operations Office in 1996 was mainly attributed to the Offices of Defense Programs and Energy Research (Figure 4.15). In 1996, Oakland Operations Office reporting sites generated about 13,000 cubic meters of waste, approximately four percent of the DOE complex-wide waste generation total (Figure 4.16). Generation of all waste types decreased in 1996 from 1995 reported amounts.

Figure 4.15 1996 Waste Generation by Cognizant Secretarial Office

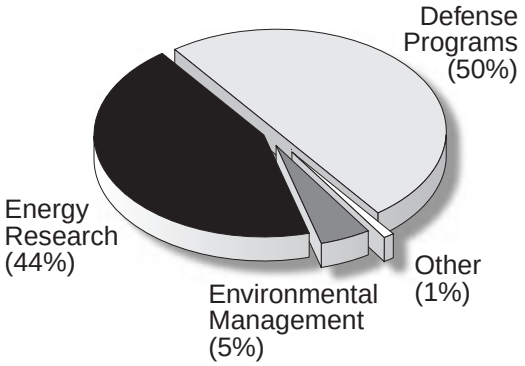
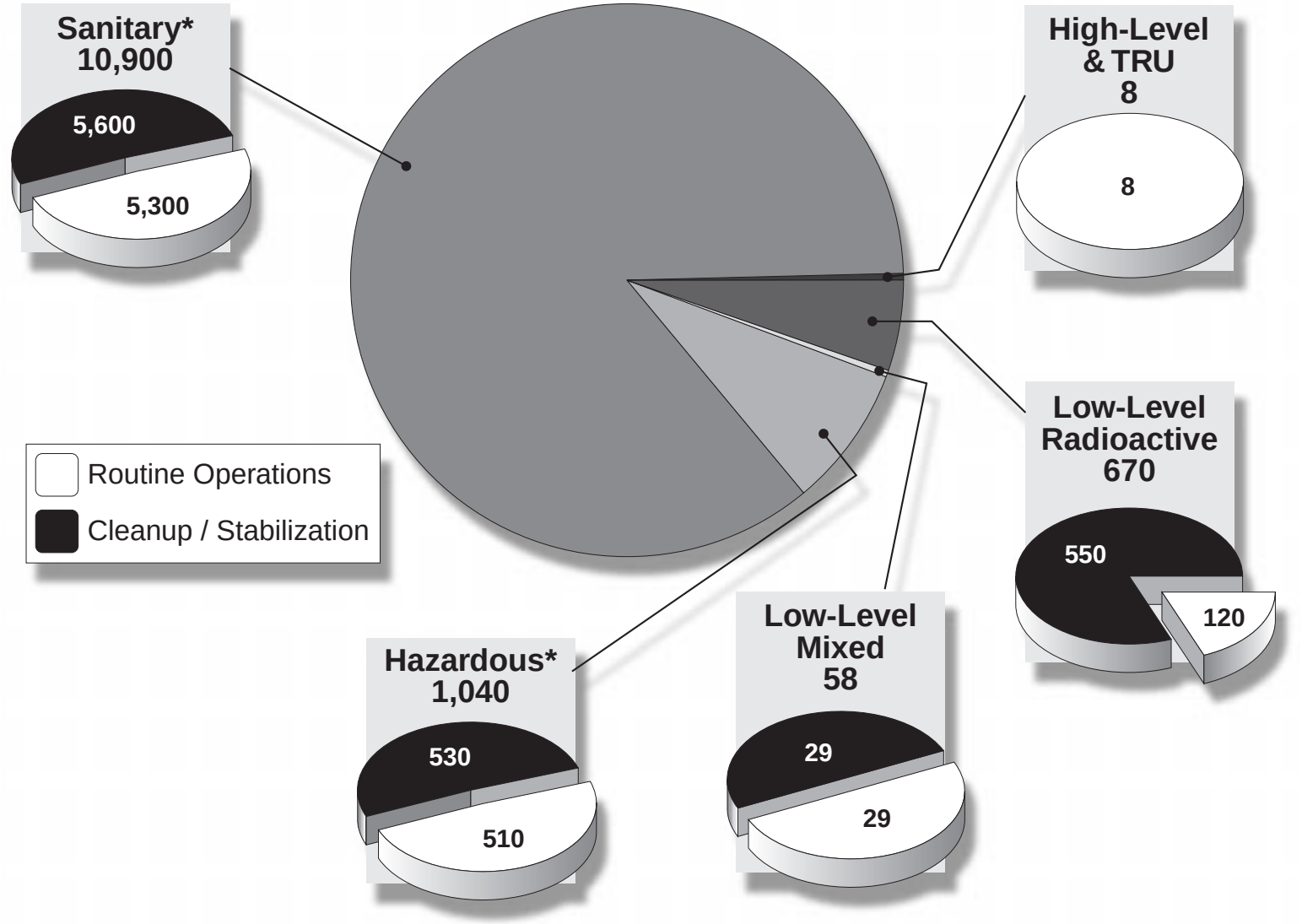


Figure 4.16 Oakland Operations Office Waste Generation, 1996

(in Cubic Meters)*



* Assuming one cubic meter is equivalent to one metric ton.

4.6 Oak Ridge Operations Office

The Oak Ridge Operations Office provides weapons component dismantlement, maintains the nation's inventory of enriched uranium and lithium, conducts a diversified research and development program on a variety of energy technologies, performs environmental management activities, oversees nuclear safety for enrichment facilities, and provides technical assistance training.

4.6.1 Performance Measures

In 1996, more than 27,000 cubic meters of waste were avoided at the Oak Ridge Operations Office's five reporting sites due to pollution prevention activities. As a result, the Oak Ridge Operations Office was successful in saving more than $35 million by implementing pollution prevention projects at its five reporting sites (Figure 4.19).

Achievements CY 1996

Number of P2 Projects:	66
Total Waste Reduced:	27,500 cubic meters
Cost Savings:	$35.3 million

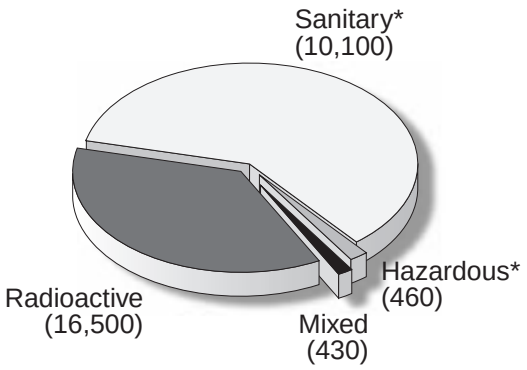
Category	Performance Measure	Goal
Radioactive Waste	77% reduction	50%
Mixed Waste	81% reduction	50%
Hazardous Waste	69% reduction	50%
Sanitary Waste	57% increase	33%
Recycling	29% recycled	33%
Affirmative Procurement	46% purchased	100%

4.6.2 Pollution Prevention Accomplishments

The Oak Ridge Operations Office conducted 66 pollution prevention projects in 1996, accounting for about 21 percent of the waste reduction within the DOE complex (Table 4.9). Projects include:

- **Oak Ridge National Laboratory** requested a site-specific standard to allow residual petroleum contamination at three former underground storage tank sites. This approach, which is acceptable to regulators, eliminated the generation of about 410 metric tons of hazardous waste and saved $1 million.

Figure 4.17 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

- **East Tennessee Technology Park** replaced 25 percent of the traditional chemistry-based photographic processes with digital non-chemistry based photographic technology. This modification eliminated about 40 cubic meters of low-level mixed waste and saved $26,000.
- **Oak Ridge Y-12 Plant** established a micro-cyanide distillation procedure to analyze National Pollutant Discharge Elimination System samples. This new technique reduced hazardous waste generation by 0.3 metric tons and saved $93,000.

Table 4.9 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
East Tennessee Technology Park; Oak Ridge, TN	19	10,400	$7,400
Oak Ridge National Laboratory; Oak Ridge, TN	17	3,200	$2,600
Oak Ridge Y-12 Plant; Oak Ridge, TN	21	12,800	$2,500
Paducah Gaseous Diffusion Plant; Paducah, KY	4	30	$114
Portsmouth Gaseous Diffusion Plant; Piketon, OH	5	1,200	$22,700

- **Paducah Gaseous Diffusion Plant** applied good operating practices and waste minimization techniques to well development projects, thereby reducing hazardous waste generation by 21 metric tons and saving $114,000.

- **Portsmouth Gaseous Diffusion Plant** separated toxic-, hazardous-, and asbestos-containing materials from radioactively contaminated materials, thereby preventing the generation of low-level mixed waste. This effort avoided 175 cubic meters of low-level mixed waste and saved approximately $23 million.

4.6.3 Waste Generation

The majority of the waste generated by the Oak Ridge Operations Office in 1996 was attributed to Defense Programs (Figure 4.18). In 1996, Oak Ridge Operations Office reporting sites generated 21 percent of the DOE complex-wide waste generation total (about 60,300 cubic meters; Figure 4.19).

In 1996, an increase occurred in transuranic waste generation at the Oak Ridge National Laboratory due to increased activity at the High Flux Isotope Reactor.

For 1996, an increase occurred in low-level mixed waste generation at the Oak Ridge Y-12 Plant from 1995 reported amounts. This increase resulted from dike/sump water and other regulated waste from an Oil Dike Facility, and sludge waste generated from the West End Treatment Facility and Central Pollution Control Facility that were not reported the previous year.

Figure 4.18 1996 Waste Generation by Cognizant Secretarial Office

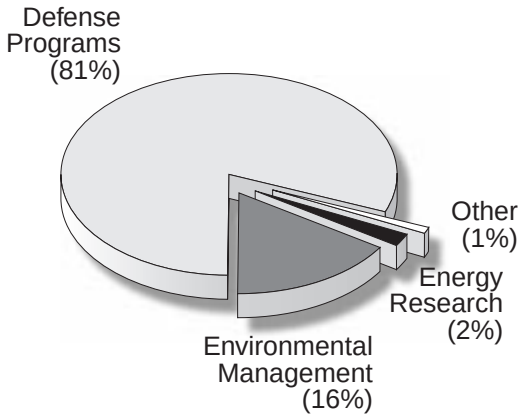
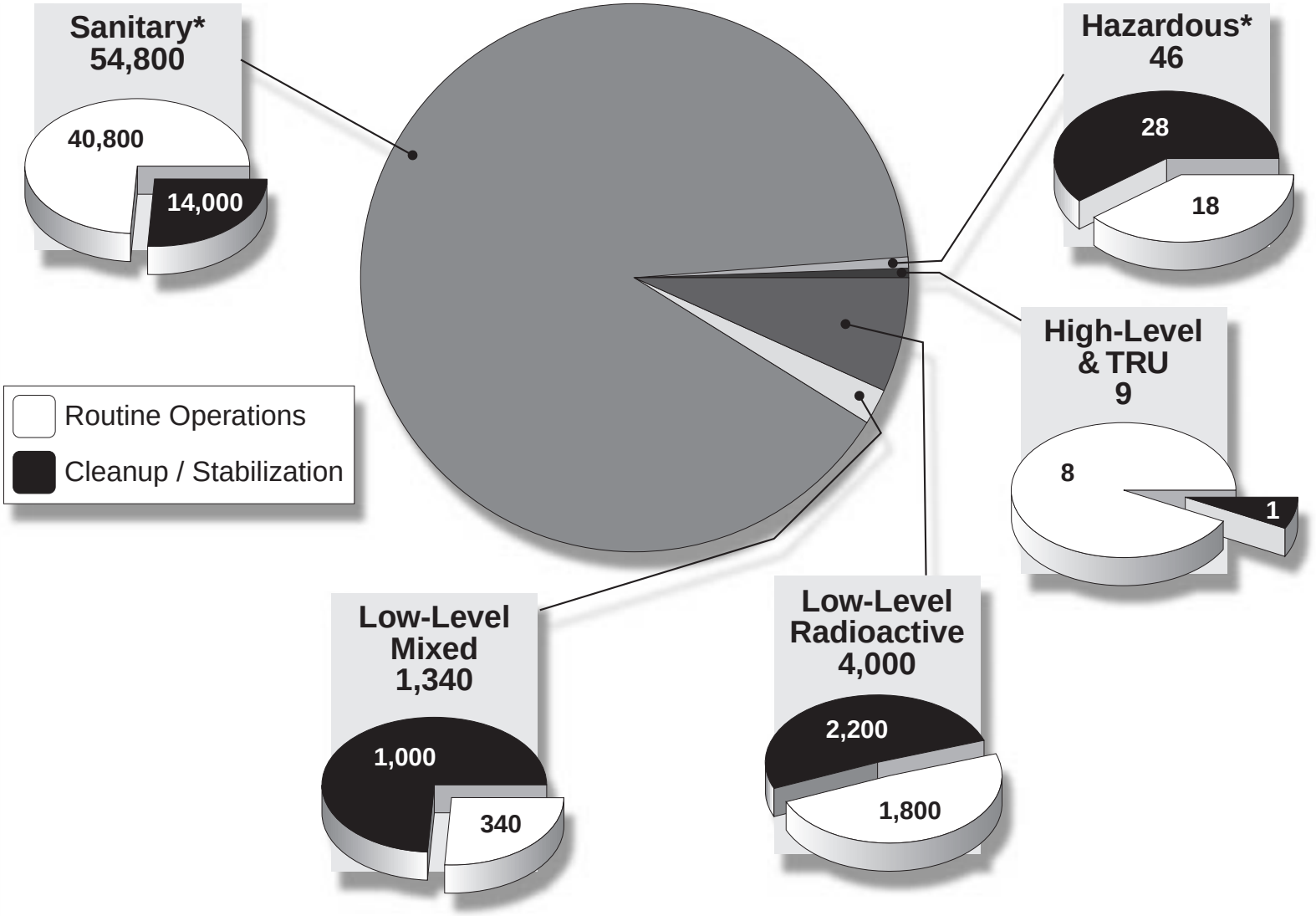


Figure 4.19 Oak Ridge Operations Office Waste Generation, 1996
(in Cubic Meters)*



* Assuming one cubic meter is equivalent to one metric ton.

4.7 Ohio Field Office

The Ohio Field Office provides administrative, financial, and technical support to Area Offices, allowing them to complete their environmental restoration, waste management, and economic development activities in support of DOE's goals.

4.7.1 Performance Measures

In 1996, about 1,300 cubic meters of waste were avoided at the Ohio Field Office's four reporting sites due to pollution prevention activities (Figure 4.20). As a result, the Ohio Field Office was successful in saving more than $4 million by implementing pollution prevention projects.

Achievements CY 1996

Number of P2 Projects:	27
Total Waste Reduced:	1,300 cubic meters
Cost Savings:	$4.4 million

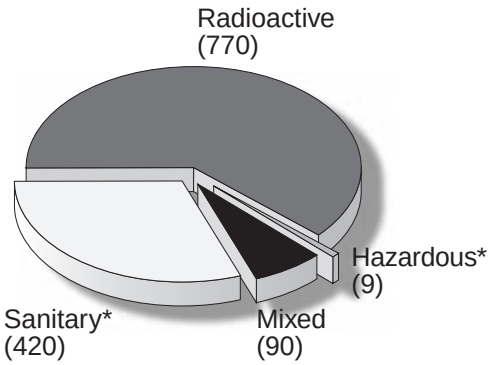
Category	Performance Measure	Goal
Radioactive Waste	68% reduction	50%
Mixed Waste	59% reduction	50%
Hazardous Waste	71% increase	50%
Sanitary Waste	58% reduction	33%
Recycling	19% recycled	33%
Affirmative Procurement	49% purchased	100%

4.7.2 Pollution Prevention Accomplishments

The Ohio Field Office conducted 27 pollution prevention projects in 1996, accounting for less than one percent of the waste reduction within the DOE complex (Table 4.10). Projects include:

- During the removal of radioactive contaminated drain lines at **Battelle Columbus Laboratories**, hazardous materials were segregated and managed separately thus minimizing the generation of low-level mixed waste. This effort eliminated about 90 cubic meters of low-level mixed waste with a total savings of about $4 million.
- **Fernald Environmental Management Project** transported washable Anti-C's to and from radiologically controlled areas in reusable bags. The bags, which are washed along with the clothing, are reused instead of being disposed. This eliminated about 70 cubic meters of low-level radioactive waste and provided a savings of $46,000.
- **Mound Plant** collected ferrous and non-ferrous metals generated by various construction and decommissioning projects and recycled them. This effort eliminated about 90 metric tons of sanitary waste from disposal and saved about $4,000.
- **West Valley Demonstration Project** surveyed eight boxes of soil assumed to be radioactively contaminated and was able to release the soil and reuse the boxes. This effort eliminated about 13 cubic meters of low-level radioactive waste and saved about $30,000.

Figure 4.20 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

Table 4.10 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Battelle Columbus Laboratories; Columbus, OH	3	130	$4,100
Fernald Environmental Management Project; Fernald, OH	3	140	$82
Mound Plant; Miamisburg, OH	5	120	$11
West Valley Demonstration Project; West Valley, NY	16	900	$200

- **West Valley Demonstration Project** sent about 770 wood pallets to a vendor for recycling instead of disposing of them in the landfill. This eliminated about 16 metric tons of sanitary waste and saved $3,500.

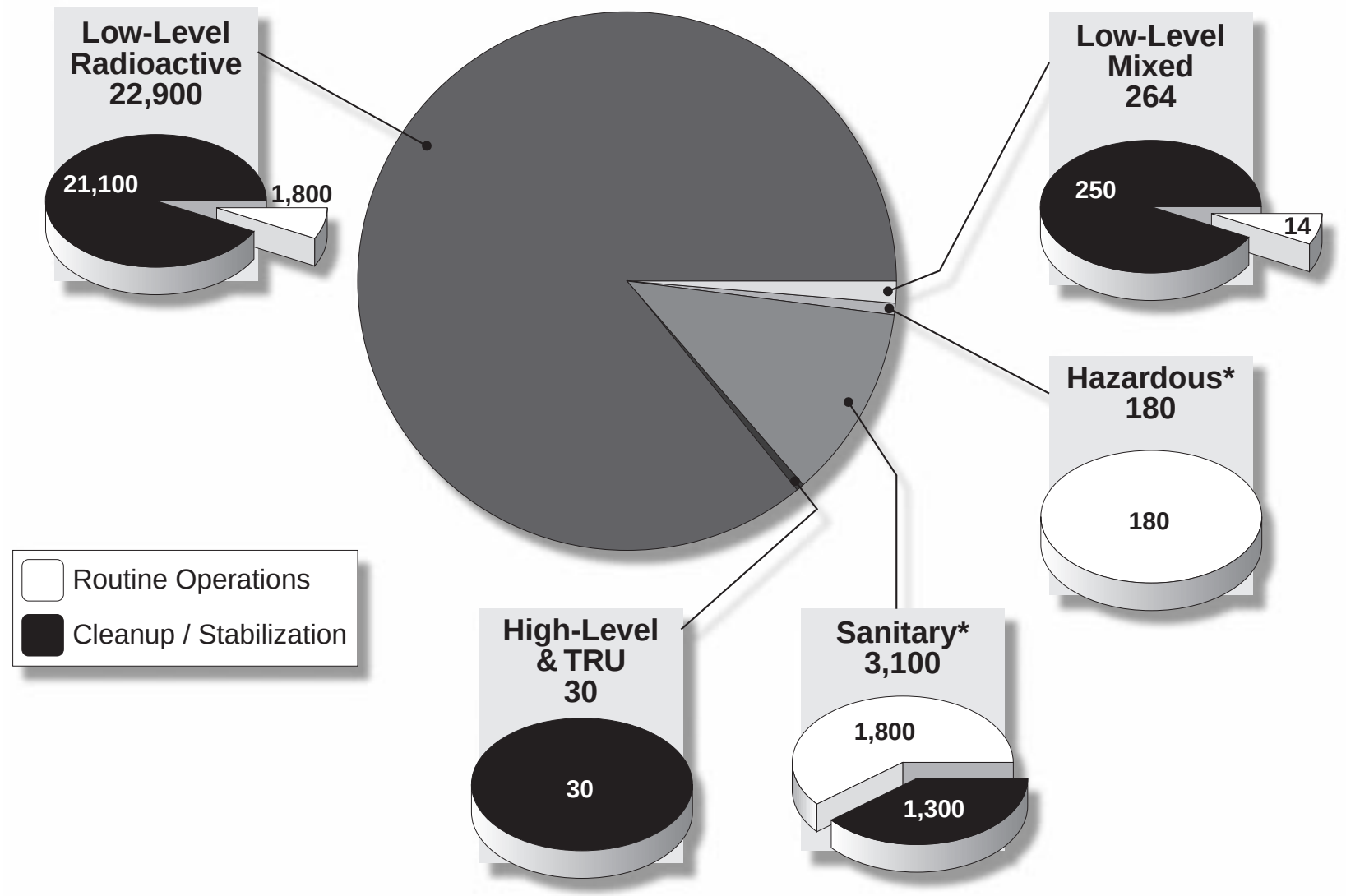
4.7.3 Waste Generation

In 1996, Ohio Field Office reporting sites generated about 26,000 cubic meters of waste, approximately nine percent of the DOE complex-wide waste generation total (Figure 4.21). For 1996, low-level mixed waste increased from 1995 reported amounts due to decommissioning activities at the Fernald Environmental Management Project.

All of the waste generated by the Ohio Field Office in 1996 was attributed to the Environmental Management Office.

Figure 4.21 Ohio Field Office Waste Generation, 1996

(in Cubic Meters)*



* Assuming one cubic meter is equivalent to one metric ton.

4.8 Richland Operations Office

The Richland Operations Office manages waste products by researching, developing, applying, and commercializing technologies in waste management, and environmental restoration. Engineering, scientific, and research programs are conducted on environmental restoration, tank waste remediation, waste management, nuclear energy, and energy research.

4.8.1 Performance Measures

In 1996, more than 30,000 cubic meters of waste were avoided at the Richland Operations Office's two reporting sites due to pollution prevention activities (Figure 4.22). As a result, the Richland Operations Office was successful in saving more than $17 million by implementing pollution prevention projects.

Achievements CY 1996

Number of P2 Projects:	114
Total Waste Reduced:	30,600 cubic meters
Cost Savings:	$17.6 million

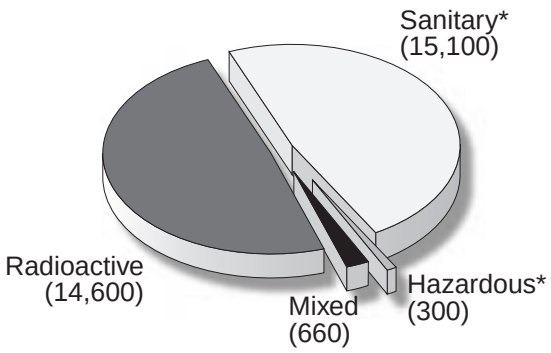
Category	Performance Measure	Goal
Radioactive Waste	66% reduction	50%
Mixed Waste	34% reduction	50%
Hazardous Waste	66% reduction	50%
Sanitary Waste	81% reduction	33%
Recycling	79% recycled	33%
Affirmative Procurement	84% purchased	100%

4.8.2 Pollution Prevention Accomplishments

The Richland Operations Office conducted 114 pollution prevention projects in 1996, accounting for about 23 percent of the waste reduction within the DOE complex (Table 4.11). Projects include:

- During the 105-N Building deactivation at the **Hanford Site**, contaminated material was removed, decontaminated and released as nonradioactive material for excess. This one-time effort eliminated about 460 cubic meters of low-level radioactive waste and saved about $900,000.

Figure 4.22 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

- **Pacific Northwest National Laboratory** replaced pumps in the 325 Facility with units that used recycled cooling water instead of once-through coolant with discharge to the radioactive liquid sewer. This modification eliminated about 2,300 cubic meters of low-level radioactive waste and saved $16,000.
- The **Hanford Site** reused decontaminated tank farm auger parts, thus avoiding waste disposal and equipment replacement costs. This effort avoided about 200 cubic meters of low-level mixed waste and saved about $3 million.

Table 4.11 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Hanford Site; Richland, WA	98	28,100	$16,000
Pacific Northwest National Laboratory; Richland, WA	16	2,500	$1,600

- The **Hanford Site** implemented a site-wide materials management program that promoted the reuse of various materials onsite rather then disposing of them as hazardous waste. This recycling effort avoided about 106 metric tons of hazardous waste and saved about $1 million in disposal and material replacement costs.

- **Pacific Northwest National Laboratory** established a laboratory equipment pool that redistributed reusable scientific, office, and electronic equipment and tools rather than dispose of then as sanitary waste. This effort eliminated 50 metric tons of sanitary waste and saved $1 million in disposal and equipment replacement costs.

4.8.3 Waste Generation

The majority of the waste generated by the Richland Operations Office in 1996 was attributed to the Environmental Management Office (Figure 4.23). In 1996, Richland Operations Office reporting sites generated approximately about 39,000 cubic meters of waste, approximately 14 percent of the DOE complex-wide waste generation total (Figure 4.24).

For 1996, low-level radioactive waste generation increased from 1995 reported amounts due to decommissioning and environmental restoration activities.

Hazardous waste generation increased from 497 metric tons in 1995 to 826 metric tons due to decommissioning and environmental restoration activities in 1996.

Figure 4.23 1996 Waste Generation by Cognizant Secretarial Office

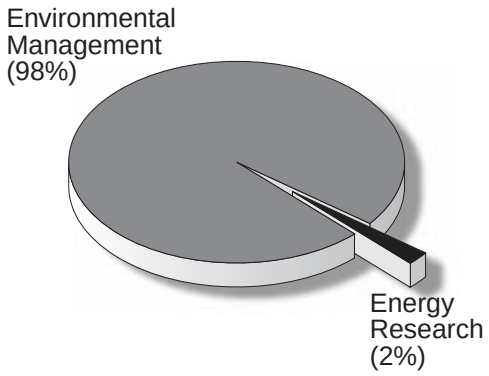
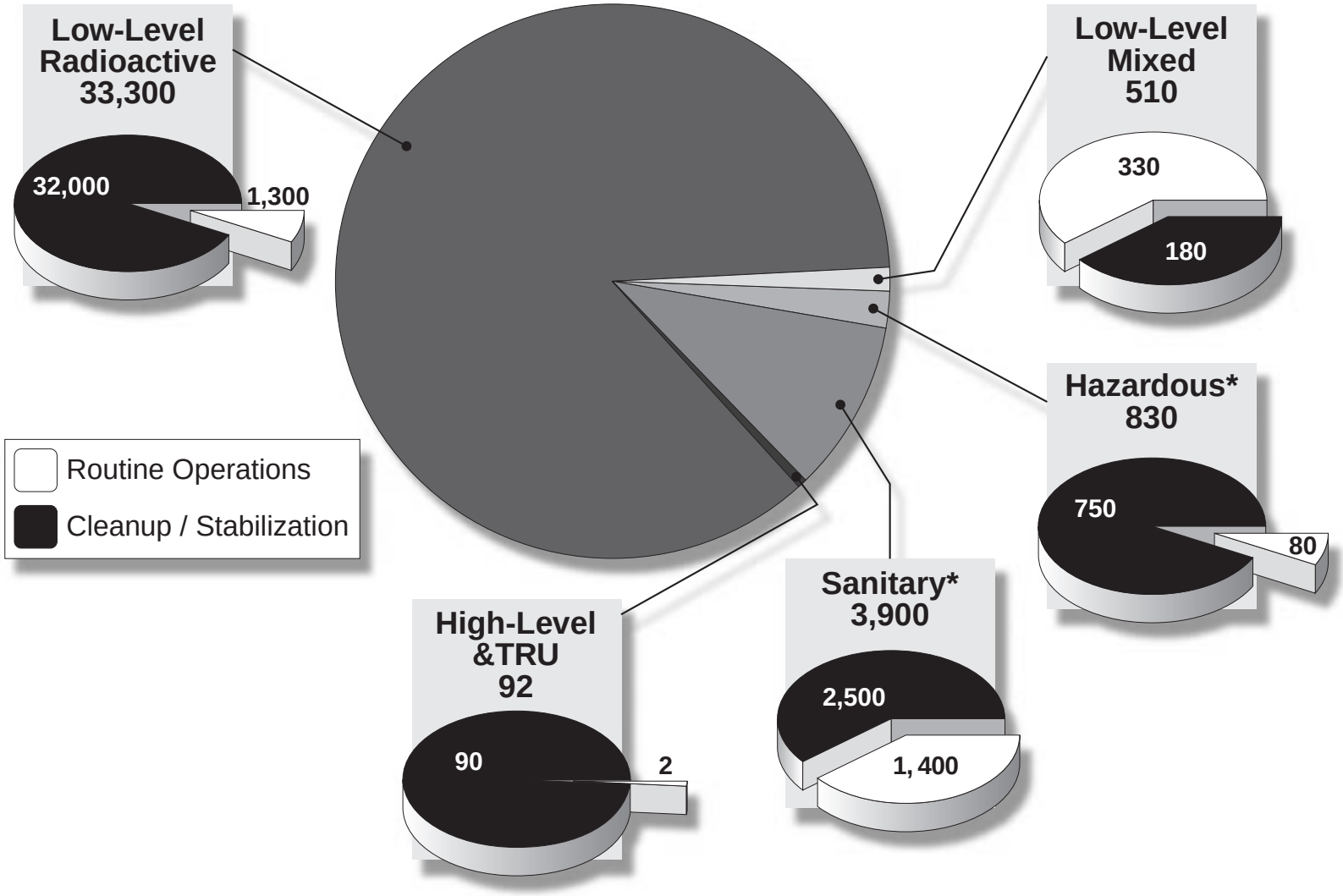


Figure 4.24 Richland Operations Office Waste Generation, 1996

(in Cubic Meters*)



* Assuming one cubic meter is equivalent to one metric ton.

4.9 Rocky Flats Field Office

The Rocky Flats Field Office manages wastes and materials, environmental cleanup operations, and conversion of the Rocky Flats Environmental Technology Site to beneficial use.

4.9.1 Performance Measures

In 1996, about 1,000 cubic meters of waste were avoided at the Rocky Flats Field Office's one reporting site due to pollution prevention activities (Figure 4.25). As a result, the Rocky Flats Field Office was successful in saving about $66,000 by implementing pollution prevention projects.

Achievements CY 1996

Number of P2 Projects:	5
Total Waste Reduced:	980 cubic meters
Cost Savings:	$66,000

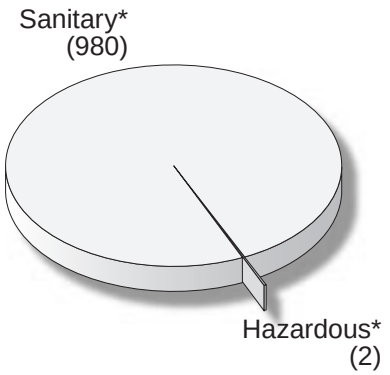
Category	Performance Measure	Goal
Radioactive Waste	10% reduction	50%
Mixed Waste	90% reduction	50%
Hazardous Waste	32% reduction	50%
Sanitary Waste	219% increase	33%
Recycling	8% recycled	33%
Affirmative Procurement	74% purchased	100%

4.9.2 Pollution Prevention Accomplishments

The Rocky Flats Field Office conducted five pollution prevention projects in 1996, accounting for less than one percent of the waste reduction within the DOE complex (Table 4.12). Projects include:

- **Rocky Flats Environmental Management Project** diverted scrap metal generated by cleanup and closure activities from the landfill by recycling it with a vendor. This effort eliminated about 700 metric tons of sanitary waste and saved $35,000.
- **Rocky Flats Environmental Management Project** recycled paper products, cardboard, and toner cartridges, thereby saving landfill space. A total of about 230 metric tons of sanitary waste was eliminated with a total savings of about $31,000.

Figure 4.25 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

4.9.3 Waste Generation

In 1996, the Rocky Flats Field Office generated about 12,000 cubic meters of waste, approximately four percent of the DOE complex-wide waste generation total.

Table 4.12 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Rocky Flats Environmental Technology Site; Golden, CO	5	980	$66

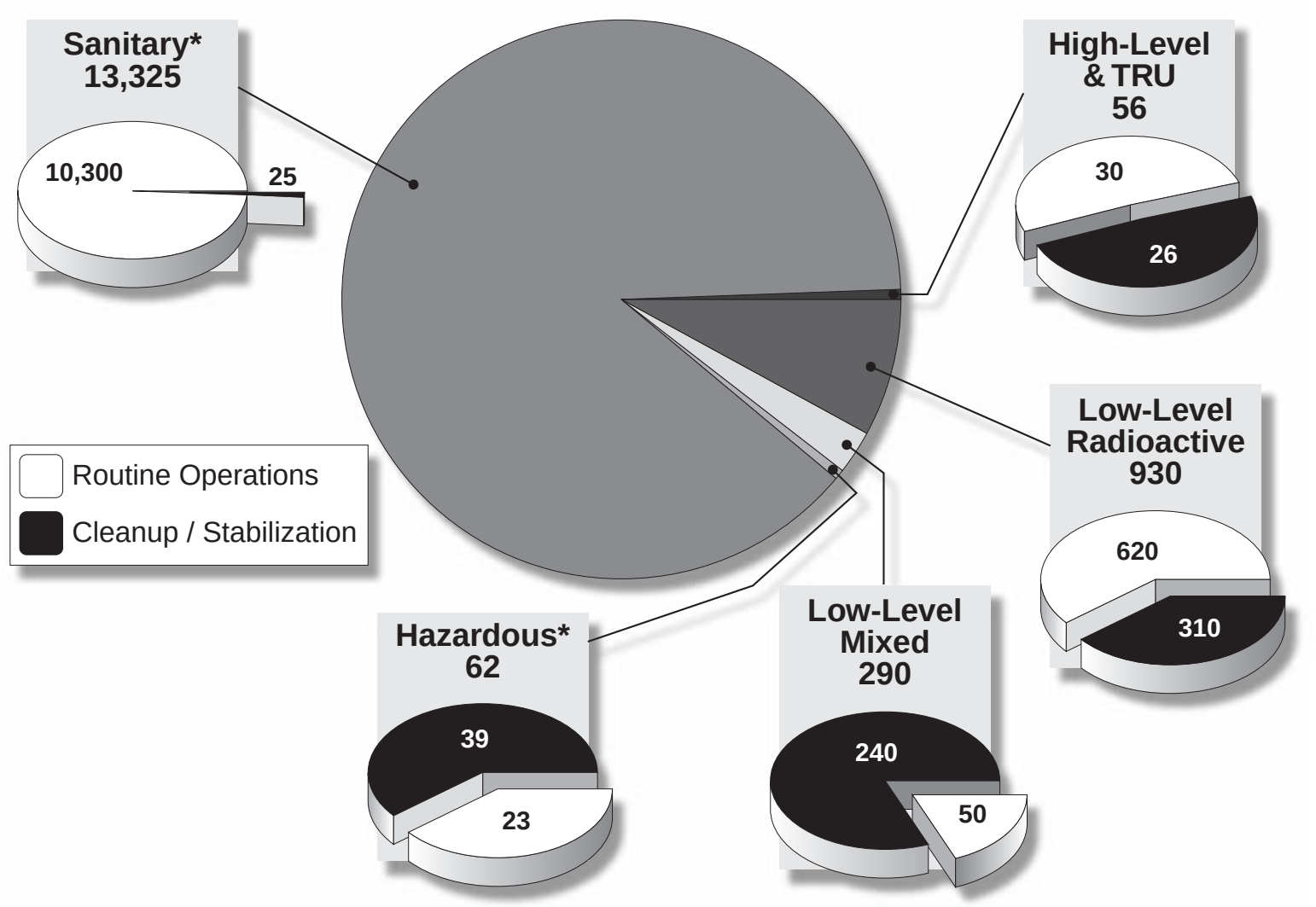
For 1996, transuranic waste generation increased from 1995 reported amounts, primarily due to metal and plastic generation in Building 707 as a result of building renovation work. Beginning decommissioning work in other nuclear facilities also contributed to this wastestream.

Low-level waste increased due to stripout and renovation of the 800 area complex in preparation of a privatized pilot project involving recycling of contaminated scrap metal. Sanitary waste generation apparently increased, however, the amount of waste generated is estimated since the waste is not weighed prior to disposal.

All of the waste generated by the Rocky Flats Field Office in 1996 was attributed to the Environmental Management Office.

Figure 4.26 Rocky Flats Field Office Waste Generation, 1996

(in Cubic Meters*)



* Assuming one cubic meter is equivalent to one metric ton.

4.10 Savannah River Operations Office

The Savannah River Operations Office serves the national interest by providing leadership, direction, and oversight to ensure that Savannah River Site programs, operations, and resources are managed in an open, safe, environmentally sound, and cost effective manner. The Operation's previous mission was to produce nuclear materials for national defense.

4.10.1 Performance Measures

In 1996, more than 8,000 cubic meters of waste were avoided at the Savannah River Operations Office's one reporting site due to pollution prevention activities (Figure 4.27). As a result, the Savannah River Operations Office was successful in saving more than $17 million by implementing pollution prevention projects.

Achievements CY 1996

Number of P2 Projects:	40
Total Waste Reduced:	8,400 cubic meters
Cost Savings:	$17.4 million

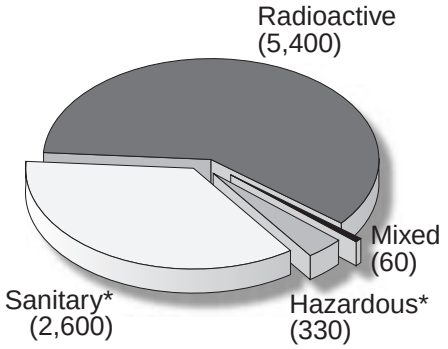
Category	Performance Measure	Goal
Radioactive Waste	63% reduction	50%
Mixed Waste	240% increase	50%
Hazardous Waste	12% reduction	50%
Sanitary Waste	58% reduction	33%
Recycling	31% recycled	33%
Affirmative Procurement	36% purchased	100%

4.10.2 Pollution Prevention Accomplishments

The Savannah River Operations Office conducted 40 pollution prevention projects in 1996, accounting for about six percent of the waste reduction within the DOE complex (Table 4.13). Projects include:

- The **Savannah River Site** replaced single-use contamination control huts and glovebags with reusable prefabricated huts and glovebags. Use of the new multi-application contamination control devices reduced low-level radioactive waste generation by about 860 cubic meters with a savings of $3.4 million.

Figure 4.27 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

- The **Savannah River Site** initiated a site-wide protocol, known as "Green-is-Clean," in approximately 40 facilities to allow Radiological Buffer Area waste to be managed as sanitary waste instead of low-level radioactive waste. This program reduced site-wide low-level radioactive waste generation by about 1,500 cubic meters with a savings of about $2.8 million.

Table 4.13 1996 Pollution Prevention Accomplishments by Site

Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Savannah River Site; Aiken, SC	40	8,400	$17,400

- The **Savannah River Site** eliminated excess chemicals from disposal as hazardous waste through onsite reuse, returning them to the manufacturer, or donating them to local entities. This effort eliminated about 35 metric tons of hazardous waste and saved about $500,000.
- The **Savannah River Site** rolled back Radiologically Contaminated Areas to Radiological Buffer Areas in four major facilities, thus eliminating the need for personal protective equipment and avoiding the generation of low-level radioactive waste. These efforts reduced low-level radioactive

waste generation by about 670 cubic meters and saved over $1 million.

4.10.3 Waste Generation

The majority of the waste generated by the Savannah River Operations Office in 1996 was attributed to the Environmental Management Office (Figure 4.28). In 1996, the Savannah River Operations Office generated about 16,000 cubic meters of waste, approximately six percent of the DOE complex-wide waste generation total (Figure 4.29).

An increase in the generation of transuranic waste from 1995 to 1996 was attributed to production start-up activities in Separation Facilities (F and H Area B-Lines). A hazardous waste generation increase was the result of 232-F decontamination and decommissioning activities. The reported increase in sanitary waste generation from 1995 to 1996 can be attributed to the estimating technique used in computing cleanup/stabilization sanitary waste generation.

Due to stabilization activities, the Savannah River Operations Office is the major source of high-level waste generation within the DOE complex; about 2,400 cubic meters of high-level waste were generated in 1996, which is 89 percent of the total high-level waste generated. High-level waste generation increased in 1996 due to continued cleanout and restart of the F-Canyon separation process.

Figure 4.28 1996 Waste Generation by Cognizant Secretarial Office

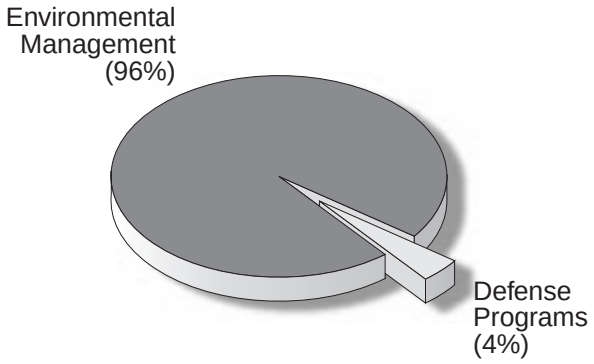
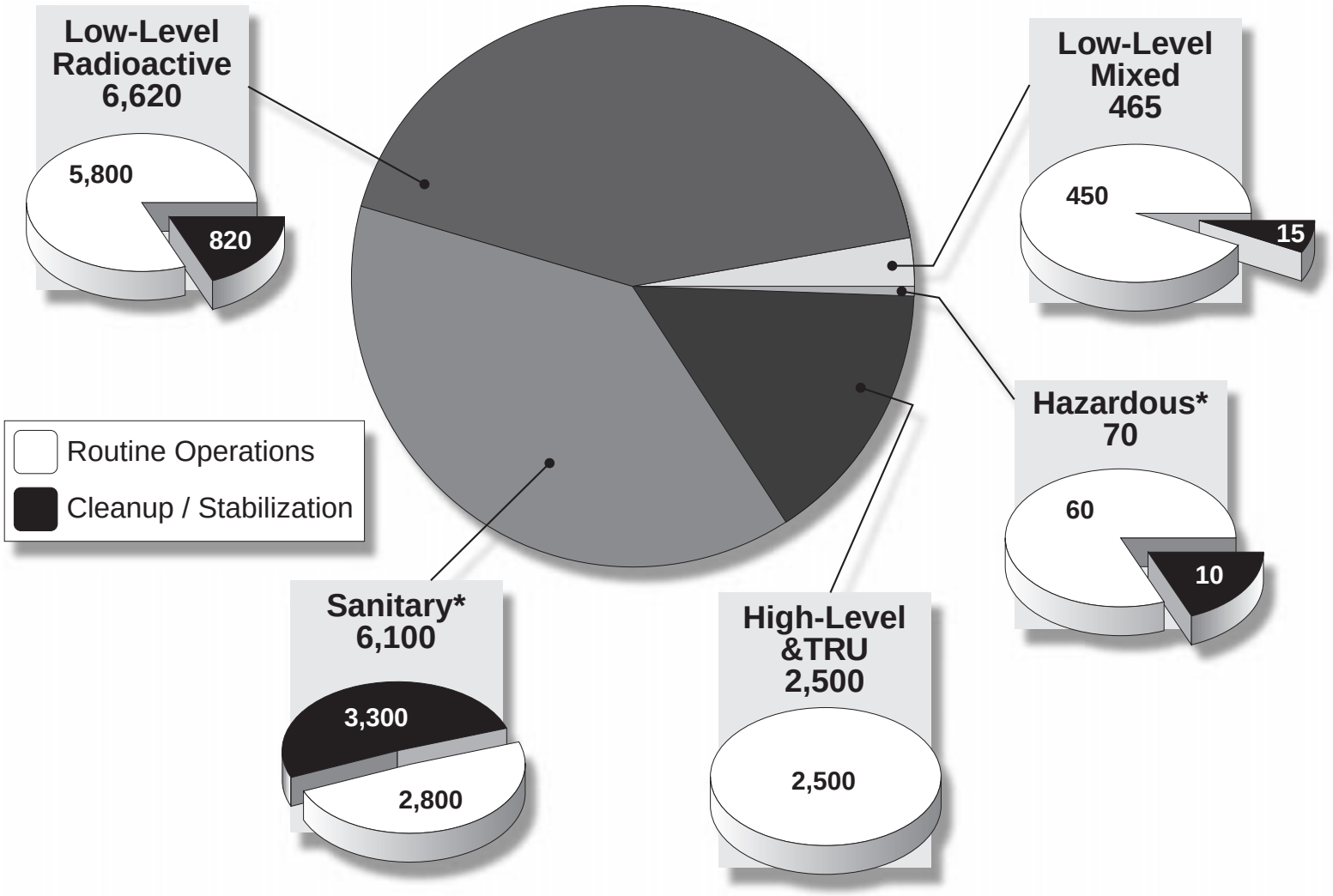


Figure 4.29 Savannah River Operations Office Waste Generation, 1996

(in Cubic Meters)*



* Assuming one cubic meter is equivalent to one metric ton.

4.11 Headquarters

The DOE sites reporting to Headquarters include the Western Area Power Administration and the Western Environmental Technology Office. The primary missions of these sites are power marketing and research and development.

4.11.1 Performance Measures

In 1996, about 2,000 cubic meters of waste were avoided at Headquarters reporting sites due to pollution prevention activities (Figure 4.30). As a result, Headquarters was successful in saving more than $500,000 by implementing pollution prevention projects.

Achievements CY 1996

Number of P2 Projects:	9
Total Waste Reduced:	2,100 cubic meters
Cost Savings:	$557,000

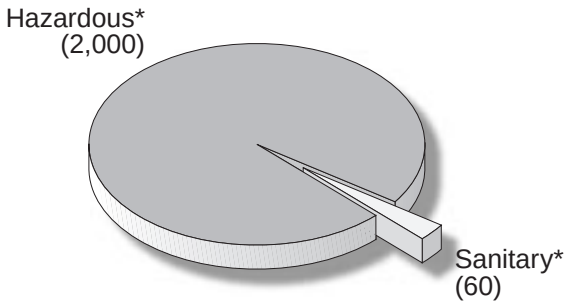
Category	Performance Measure	Goal
Hazardous Waste	58% reduction	50%
Sanitary Waste	59% reduction	33%
Recycling	16% recycled	33%
Affirmative Procurement	58% purchased	100%

4.11.2 Pollution Prevention Accomplishments

Headquarters conducted nine pollution prevention projects in 1996, accounting for less than two percent of the waste reduction within the DOE complex (Table 4.14). Projects include:

- **Western Area Power Administration**, Desert Southwest Region, recycled used transformer oil that was stored in aboveground storage tanks at the Coolidge and Tucson Substations. This effort avoided the generation of about 106 metric tons of hazardous waste and saved about $47,000.
- **Western Area Power Administration**, Sierra Nevada Region, implemented an aggressive sampling program during the decommissioning and remediation of a major capacitor bank on the Pacific Intertie that greatly reduced the amount of soil, steel, and debris that had to be removed and disposed as hazardous waste. This effort avoided the generation of about 1,500 metric tons of hazardous waste and saved $400,000.
- **Western Area Power Administration**, Upper Great Plains Region, shipped used transformer oil to an oil recycle vendor for energy recovery. This effort eliminated about 260 metric tons of hazardous waste and saved $94,000.

Figure 4.30 1996 Pollution Prevention Waste Reduction by Category
(in Cubic Meters*)



** Assuming one cubic meter is equivalent to one metric ton.*

Table 4.14 1996 Pollution Prevention Accomplishments by Site

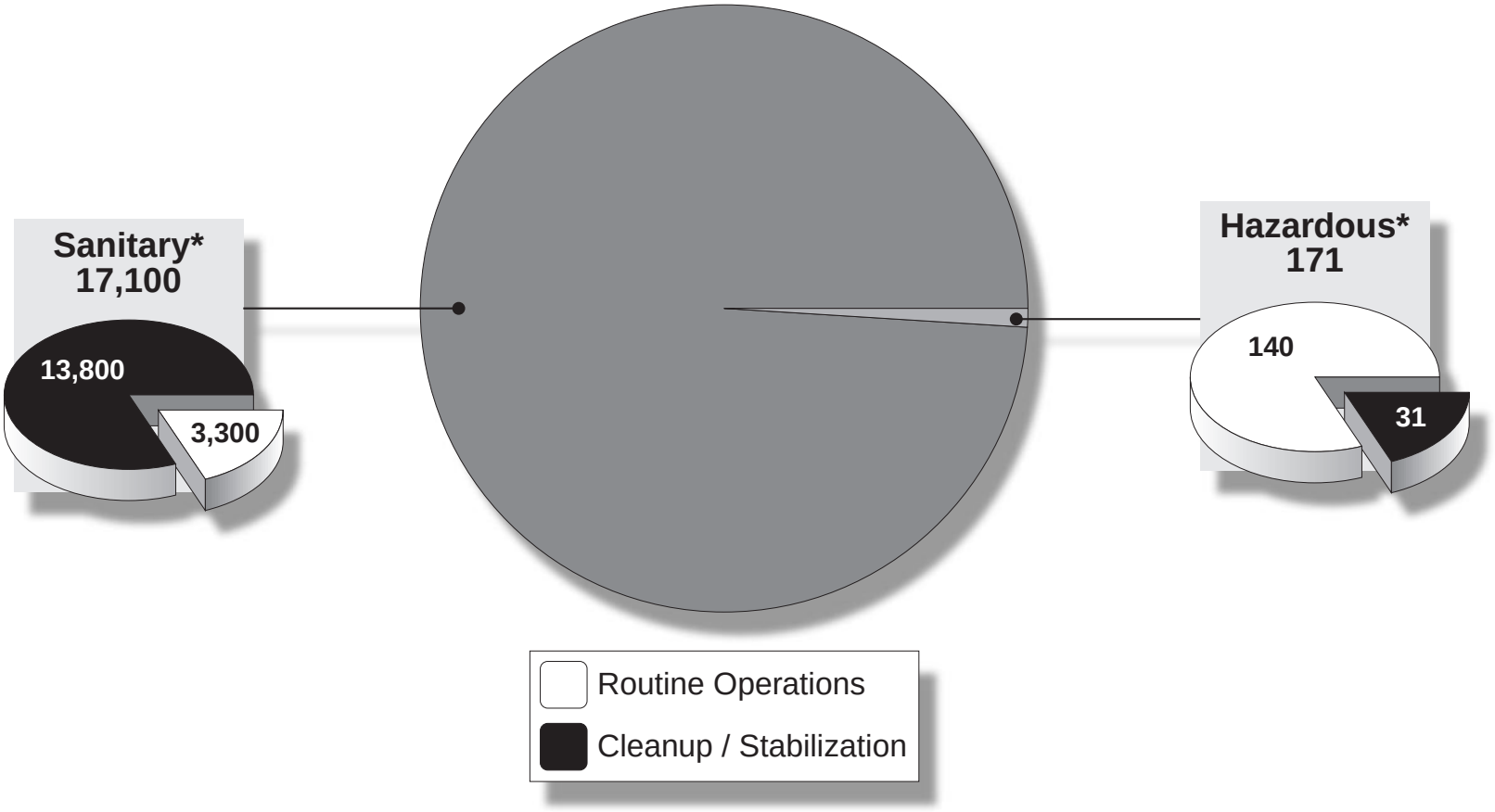
Site Name; Location	Number of Pollution Prevention Projects	Waste Reduction (Cubic Meters)	Cost Avoided (Thousands)
Western Area Power Administration; Golden, CO	9	2,100	$557
Western Environmental Technology Office; Butte, MT	–	–	–

4.11.3 Waste Generation

In 1996, DOE Headquarters reporting sites generated about 17,000 metric tons of waste, which represents about six percent of the DOE complex-wide waste generation total (Figure 4.31). The majority of the waste generated by Headquarters in 1996 was attributed to the Program Management Office.

Figure 4.31 Headquarters Waste Generation, 1996

(in Cubic Meters)*



* Assuming one cubic meter is equivalent to one metric ton.